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THE HAMBIDGE THEORY OF SYMMETRY AND PROPORTION IN GREEK ARCHITECTURE AS RELATING TO ARCHITECTURAL DESIGN

BY JAMES A. KANE

DURING the past centuries the underlying principles of Greek design, especially those of symmetry and proportion, have been little understood. The excellence of this design has been freely conceded, competent opinion being practically unanimous in this regard. However, just the opposite situation exists as to the underlying cause of this remarkable excellence—an excellence which in certain examples approaches perfection. Gaudet, for example, says in his Eléments et Théorie de l' Architecture: "le Parthénon..., c'est, vous le savez, la perfection meme"....

The one underlying principle based upon undisputed fact that has been pointed out in this connection, is that of construction. Aside from this one law, these remarkable accomplishments in design have been explained as the result of a superior architectural instinct possessed by the Greek architect of that period.

However, with the information recently placed at our disposal, can we let this explanation stand as a satisfactory one? Was this work due simply to a combination of the knowledge of the just employment of constructive principles coupled with a very keen architectural perception? Or, had the architects of this age enlarged their understanding by the acquisition and employment of some principle of design comparatively unknown and unused by us? Should the latter be the case, we would have a reasonable explanation of their unexcelled efforts—efforts that are almost without parallel in the annals of human endeavor. There are indeed few examples of such efforts made by men over 2,000 years ago which have stood without peer throughout the succeeding ages; yet few will admit that in intelligence, earnestness of purpose and artistic perception, the most distinguished members of our profession are inferior to men living centuries ago.

Men have enormously enlarged their understanding since the days of Pericles, Phidias and Ictinus. The accumulated knowledge of centuries has been systematized, and disseminated by our great educational institutions. No longer do the collateral branches of our profession offer unknown difficulties. Planning, composition and graphic expression have been developed to a degree probably undreamed of by the Greek. A broad comprehensive knowledge has taken the place of a restricted one. Yet, we cannot say with any degree of assurance, that we have excelled or even equalled the work of our Greek predecessors.

Since we cannot admit that intellectually we are inferior to the men whose work we so frankly admire, their understanding of the problem of design and proportion must have been in some way superior to ours. It is reasonable to suppose, as has been previously suggested, that this superiority was due in large measure to the knowledge and application of some principle neglected by us. Two pertinent questions now naturally arise: First, what could this idea or principle be? Second, what is the probability of the Greek having knowledge of it, and employing it? The only way, in all probability, of either of these questions being answered lies in a careful study and examination of the work of classic Greece in a broad and open-minded manner.

It has long been recognized by many that the monumental structures of Greece have differed in some important manner from those of Rome and subsequent structures. Attempts to explain the proportion of the work of classic Greece, especially that of the Parthenon, based upon the employment of the linear module, or by certain linear proportions, have been unsuccessful. The most scientific explanations are those by Penrose and Lloyd—but all such explanations lack conviction and are unsatisfactory, especially as the results are almost always more or less rough approximations.

Now, as is well known, the Roman and much

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subsequent work is largely commensurable in any two dimensions; or, architecturally speaking, is co-ordinated to a great extent by the use of the module, but in the best examples of the Periclean Age of Greece, this more or less simple device of co-ordination does not exist. Yet there must exist in this work a co-ordinating principle, otherwise "perfection" never could have resulted.

This brings us to the point where light has been thrown upon this situation in a most important manner, by the result of the remarkable observations made by Mr. Hambidge. For the first time in centuries we have our attention called to an entirely new idea or mental standpoint—to a conception which will give us, it seems certain, the necessary additional mental tools to approach our problems armed with the Greek principle of design.

This idea in its simplest form is the idea of measuring or obtaining proportion by areas rather than by linear units. Our facilities of measurement are so well developed and understood that it is difficult to conceive of any other manner of measurement than our own being a practical and natural one, but when it is realized that these facilities were not possessed by the Greek, it is seen that he was forced to employ other means than ours. His surveying instruments were primitive. For this purpose he was compelled to rely upon the "measuring cord" or rope. Furthermore, the science of arithmetic, as we now understand it, was then unknown. This is an important fact. Consequently, the mental attitude of the Greek toward the problem of mensuration and proportion would be governed largely by these circumstances. An idea of just what this mental attitude was may be obtained from a consideration of the origin and development of the science of surveying employed by the Greek and his predecessor, the Egyptian.

The method of surveying or "cording of temples" by means of a rope dates from earliest antiquity. In the hands of the Egyptian, "cording" became a highly developed science. There exist many references to this process in Egyptian inscriptions. The surveyors who "corded" the Egyptian temples were known by the Greeks as the Harpedonaptae or rope-stretchers, and were regarded by the Greeks as expert geometers. The knowledge of this science was obtained by the Greeks from the Egyptians as early as the sixth century B. C. and was at an early period applied by them to the needs of architecture—as shown by the history of the famous "Duplication of the cube" problem. In the hands of the Greek this science was rapidly developed and perfected, and formed, it seems certain from Mr. Hambidge's researches, the basis of the correlating principle of proportion in their architectural compositions. How this actually could have been so may be understood further by a consideration of the result obtained from surveying by means of the rope, and the lack of knowledge of arithmetic.

Now suppose it is desired to know the size of a rectangular plan of this type: Today its size or area might be found by multiplication as follows: 10′ x 15′=150 sq. ft. Without the knowledge of arithmetic its size could not be determined in this manner. However, a method open to the Greek was this: To refer the size of the rectangle to that of a square in one end of the rectangle thus:

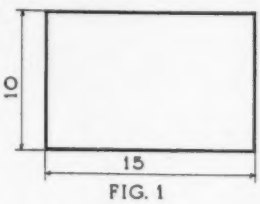


FIG. 1

This plan then could be described as a square and ½ rectangle (the size of the square being 10′) or for example as a rectangular plan 2 squares (of 5 ft.) wide and three squares (of 5 ft.) long, which was doubtless the Greek method. There would be of course an endless number of plans of this type.

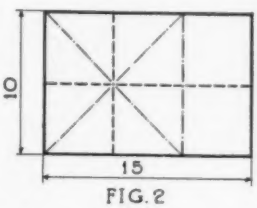


FIG. 2

Another type of plan easily surveyed by this method in which are inherent important proportional properties is a rectangular plan of this type: Again, its size or area could be determined by arithmetic as follows: 10′ x 14.142 = 141.42 sq. ft. Here the decimal fraction occurs as an apparent obstacle to the Greek (it was not until as late as the 16th century that the use of the decimal was advocated). After constructing the square in the end of the rectangle, the length will be found to be the diagonal of this square. The Greek could then describe this plan by saying that it was a rectangle whose length was the diagonal of the square on its end—(the side of the square being 10′). Other rectangles of this type are rectangles such as: the rectangle whose end is as above but one whose side is the diagonal of the latter rectangle; one whose side is twice the end; or one whose side is the diagonal of two squares on its end, etc. It will be observed that there have been indicated two methods of determining and describing areas—first, the usual one of today by linear measurement and arithmetic; second, that doubtless employed by the Greeks, i. e., by referring the size of the rectangle to the size of a square constructed on the end of it, a method of mensuration entirely by area, a method which is in

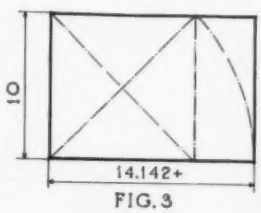


FIG. 3

its character geometric and not arithmetric.

It will also be seen that while both types of rectangles were measured by areas, these types differ radically from each other. In the first type the areas are divided by ordinals and consist of squares, their widths and lengths being commensurable; in the second type the ends and sides are incommensurable but have a definite relation to each other. In the first of these rectangles for example, if 10 is squared the result is 100 while $14.142 + ^2$ equals 200. That is, the square on the end and that on the side are as 1:2, therefore the ends and sides are commensurable in squares. The ends and sides of the other rectangles of this type mentioned above are commensurable in squares in the following proportions 1:3, 1:4, 1:5, etc. The fact that the ends and sides of these rectangles are commensurable in squares has an important bearing on their relation to Greek design.

The Greek architects, as their work in the light of Mr. Hambidge's investigation shows, entirely abandoned the use of all other rectangles than those of the latter type. To the logical mind of the Greek these rectangles made an appeal, doubtless on account of their properties mentioned above and through the opportunities they offered for the study of proportion. As it is difficult to realize how a knowledge of proportion could have been obtained at that time other than by geometric means, these rectangles and the right-angled triangle offered almost unlimited opportunities for investigation. That proportional relations were thoroughly understood is amply attested by existing records. We must therefore expect to find that in all Greek work of the classic period the proportional relations are geometric in character.

The relation these rectangles bear to each other and the simplicity of surveying them may be shown by means of a rope and the knowledge that a triangle whose sides are 3, 4, and 5 units is a right triangle, a fact which apparently was known at a very early period. For this purpose it is supposed that the rope is covered with some material and carefully calibrated and that rings are inserted at fixed intervals through which pegs may be driven.

A square plan may be laid out with a rope, as follows: First drive a stake through the ring at A. At B, 4 units from A, with the rope taut, drive another stake through the ring at this point. Then with a portion of rope nine units in length from B, drive a stake through the ring at the end of the ninth unit and third one from B to A, at D. There is now an unstretched loop of nine units from B to D. Through the fourth one from B, i. e., the fifth from D, with both sections taut, drive a stake through the ring at C. We would then have a right angle at B and three corners of a square at B, A and C.

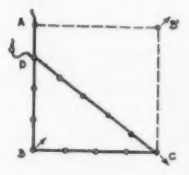


FIG 4

To locate the fourth corner, release the rope at B and at D, with the ends A and C fixed. Draw the ring B diagonally in the direction of B^1 a stake driven through the ring B when the segments become taut will locate the fourth corner of the square. This is an operation much simpler to perform than to describe.

Having constructed the square suppose it is desired to construct a rectangle whose length equals the diagonal of the square. The point C is fixed. There is a free end at D. Draw the rope taut to B. With the distance BC as a radius and C as a center, swing it down in the position CE. A similar operation with B as center will give the remaining corner F. We now have a rectangle whose end and side are as the side of a square to the square's diagonal.

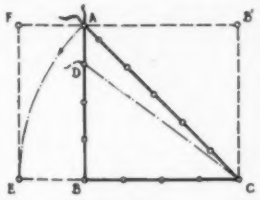


FIG. 5

Again, suppose we have constructed the rectangle just described but desire a somewhat longer one. This could be accomplished by stretching the rope from C to F and revolving it, and by repeating the operation with B as the center.

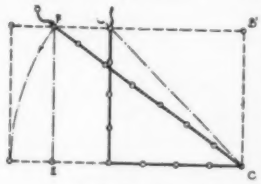


FIG. 6

A larger rectangle of two squares can be obtained by revolving the diagonal of the rectangle just described or by a similar operation to that in constructing one square, which an inspection of the diagram will show.

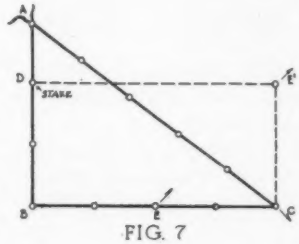


FIG. 7

A still larger rectangle can be obtained by revolving the free end with C as a center and CD as the radius and repeating the operation with B as center, or by constructing one square and with the center of the side of this square as a center

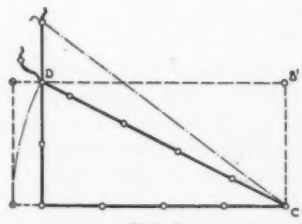


FIG. 8

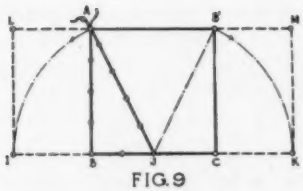


FIG. 9

and the distance JA or JB as a radius, revolving the rope to JK or JI. By the latter operation, we have also constructed the rectangle ABKM.

The following rectangles have been very simply and naturally laid out:

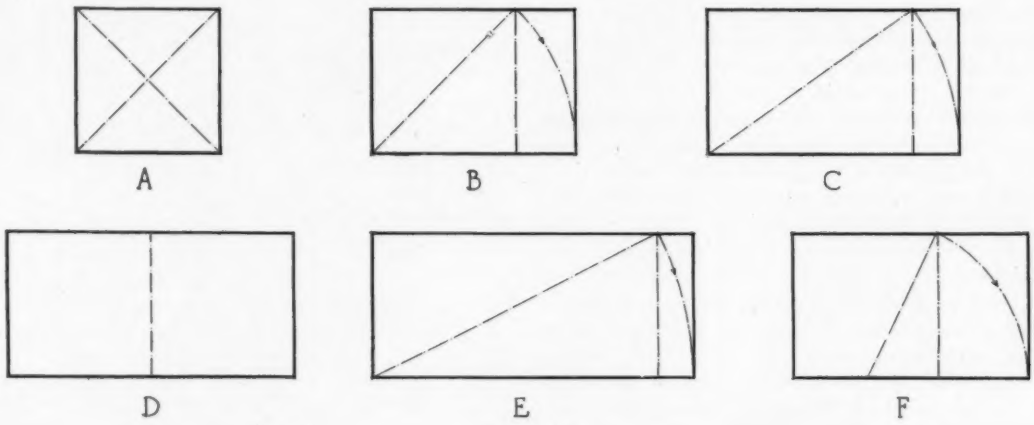


FIG. 10

Considering the width as the side of a square in each case, the lengths of the rectangles are: A, the width of a square, i. e. a square; B, the diagonal of a square; C, the diagonal of B; D, the width of two squares, i. e. two squares; E, the diagonal of two squares; F, one-half the side of a square, plus the diagonal of a half a square.

Having laid out these rectangles the Hambidge theory of Greek design may be more readily understood. This theory may be stated as follows:

That the design of classic Greece was correlated by means of applied Geometry—only certain areas, however, being employed whose properties were thoroughly understood; the areas, or rectangles forming the basis of the design, being the rectangles just laid out, i. e. the rectangles A, B, C, D, E and F.

The latter two rectangles furnish the correlating proportions of their great masterpieces such as the temple at Bassae, the Erectheum and the Parthenon. There can be little doubt that this could have been the natural result of the employment of the means at their disposal, while from a careful investigation of Mr. Hambidge's work it seems almost beyond doubt that this result has been obtained by the Greeks.

It has been seen that the fundamental operations in the determination of the size of any rectangle was the process of referring it to a square. This is a simple example of the Greek conception of what is called "the application of areas." The method was further employed by applying other areas than squares in any given area, in order that the latter area might be understood, and its proportional parts used as elements of design. (It was not considered necessary that the applied areas be smaller. They could be equal, smaller or larger). How different then is the Greek conception of size or relative proportion from ours! And how natural that he should have had this viewpoint. It may now be observed first that the Greek method of mensuration was in fact applied practical geometry, and so considered by the Greek; second that the problem of proportion was studied and understood through geometric means. It then follows that the plans, at least, of their temples would be laid out by a geometric process—the stretched rope taking the place of our lines. To the logical Greek mind it would be natural and consistent to apply the same process to the elevations and details of his structure. That this actually was the case is clearly indicated by Mr. Hambidge's observations. These observations disclose the fact that when certain ratios are found to exist in the plan these same ratios are found throughout the entire structure, plan, elevation and details. For example, in the Parthenon the proportional ratios throughout are those inherent in the rectangle whose length is the diagonal of two squares on its end and the square, a component part of this rectangle.

To produce these ratios it seems that the Greek architect proceeded either of these ways:—First, to select some rectangle to form the basis of the design such as the rectangle that forms the basis of the Parthenon design, i. e., one composed of a

square and the rectangle whose length was the diagonal of two squares on its end placed as shown in Fig. 11 and then to build up the entire composition by using only the logical component parts of this rectangle, or, second,—to determine first his desired fundamental dimension. This dimension might have been the length of the architrave, i. e., the typical column center dimension, or his total length or width. Probably for structural reasons the column center would be selected, the approximate length and width would then be determined, for example, by the number of columns desired. In any case the next step would be to establish a rectangle to form the basis for the design, such as that occupied by the small projection below the first step, i. e. the leveling course. This rectangle having been established, every part of the plan and elevation as well as of the details was made some logical geometric subdivision of this rectangle.

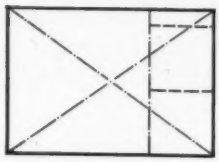
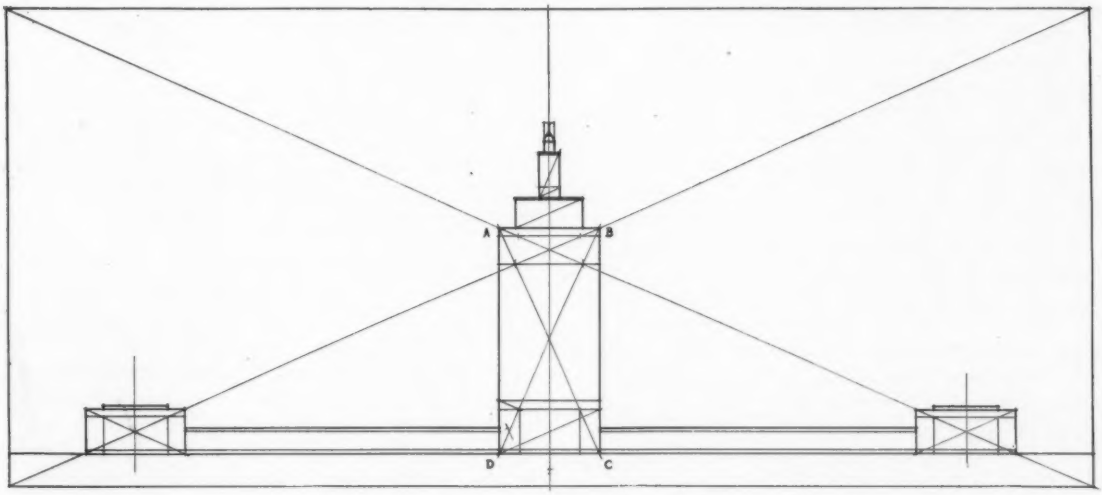


FIG. 11

The underlying idea then of Greek design was the conception that the component parts of a design should bear a geometric relationship to each other and to the whole composition in terms of a fixed area.

The accompanying diagrammatic sketch may serve in an elementary way to explain this idea and to suggest some of its possibilities. As a basis for this illustration, the rectangle whose length is the diagonal of two squares on its end has been selected. Here the rectangle ABCD was first laid out. The other parts were obtained by the elementary process of using forms whose diagonals are parallel to or perpendicular to that of the original rectangle, or those whose ends or sides are determined by the intersection of these diagonals.



ARCHITECTURAL ACOUSTICS

The Transmission of Sound through Flexible Materials—Part II

Being part of an investigation of an inclusive research program upon the general problem of the transmission of sound in buildings

BY PAUL E. SABINE

IT appears then that we may express the "sound insulating" values of a material of this character by giving the values of two coefficients which are experimentally determinable for any pitch, and that the relative merits of two different materials may be compared quantitatively by a comparison of these coefficients.

It was next of interest to know whether the comparatively simple law of transmission exhibited by this loosely felted material applies to somewhat more complex materials of the same general nature. Accordingly measurements were made upon a considerable number of materials that have been more or less widely used commercially as "sound deadeners." The tests were made upon samples of uniform size, mounted in the same manner in the doorway between the Sound Chamber and the Test Chamber. Successive layers were in contact, being held at the edges between felted wooden frames bolted together. All possible precautions were taken to prevent the passage of sound through cracks at the edges of these frames.

Of the various materials tested the results for six are presented as typical. These panels differed rather widely in their physical properties, so that a study of the results with these differences in mind may have considerable bearing upon the general problem of sound insulation.

TABLE 2

Sample	Thickness per layer	Material: Filler	Material: Covering
1	1″	Hair felt, wt. 9 lbs. per cu. ft.	None
2	½″	Sea weed, wt. 6.8 lbs per cu. ft.	Light paper, .015 lbs. per sq. ft. stitched at 3″ intervals.
3	½″	Coarse, woody, vegetable fibre, pressed into flexible board, wt. 15 lbs. per cu. ft.	None
4	½″	Light, fine, soft, vegetable fibre, wt. 9 lbs. per cu. ft.	Heavy paper, .092 lbs. per sq. ft. stitched at 6″ intervals.
5	½″	Mixed hair and fibrous asbestos, wt. 25 lbs. per cu. ft.	Heavy paper, .092 lbs. per sq. ft. stitched at 16″ intervals.
6	½″	Mixed hair and fibrous asbestos, wt. 31 lbs. per cu. ft.	One side, heavy paper .092 lbs. per sq. ft. Other side—Burlap.

These materials are described in Table 2. With the exception of Numbers 1, and 3 they were made of fibrous materials held together by being stitched between sheets of heavy paper. The results show how important a part is played by this paper covering, so that its mass is given. The results of the transmission tests are represented in Figure (3).

TABLE 3

Sample	Mass per sq. ft. 1″ thick	C_2		C_3		C_4		C_5		C_6		C_7	
		r	q	r	q	r	q	r	q	r	q	r	q
1	.74	.38	.10	.25	.20	.35	.28	.35	.37	.26	.43	.48	.43
2	.60	.85	.36	.67	.36	.68	.56	.33	.86	.35	.90	.30	.94
3	1.28	.77	.64	.77	.52	.68	.74	1.00	1.04	.10	1.78	.22	2.02
4	.8	.75	.42	.60	.34	.50	.44	.45	1.42	.50	2.74	1.00	3.12
5	2.1	1.22	.56	1.30	.60	1.22	1.08	1.06	1.64	.85	2.90		
6	2.6	.60	.90	.96	.86	.87	1.60	.60	2.44	.50	4.00		

For the sake of ready comparison with other materials, the results for the felt are presented again as Sample Number 1. The coordinates in Figure 3 are the same as in Figure 2.

The graphs drawn are the best representation of the experimental results. To avoid confusing the figures, the experimental points actually obtained are not inserted. It should be stated, however, that these points fall no further from the values indicated by the graphs than was the case with hair felt. Most of the values represent the average of the results of observations taken by two different observers. The agreement between the values obtained by the two observers was close so that there is ample grounds for confidence in the essential correctness of these values. The departure from the straight line noted in the curves for the two highest tones with Samples 4 and 5 is explicable on the assumption of a possible by-path for sound other than through the sample. Efforts to eliminate this possibility by greater care in preventing the passage through cracks around the edges of the frames proved ineffective in changing the results. The difficulty of securing an ideal mounting for materials of this character is very great, however, and in the absence of any good theoretical reason for supposing a different law of transmission in the cases referred to from all the other cases in which the simple logarithmic law seems to hold, it has been assumed that the departures from this law are to be explained in this way. The point will bear further study, however.

We may accordingly, extend the law expressed by Equation 3 to all materials of what may be des-

cribed as a "quilt-like" character, i. e. materials in which the elastic forces are small as compared with damping forces. The constants r and q of Equation 3 may be taken from the graphs in the manner illustrated by the felt after which we may compute the sound insulating efficiency of any number of units of the material in question. In

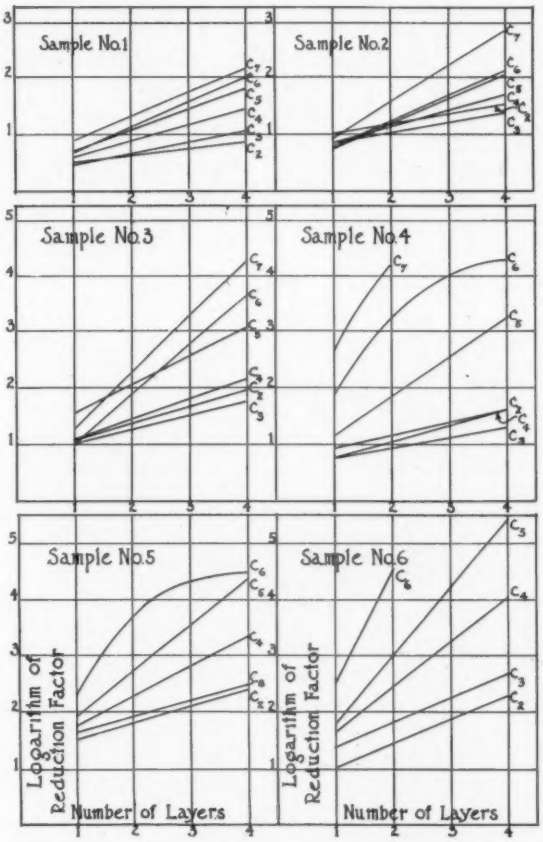


Figure 3. Reduction of Intensity of Sound transmitted by six different materials. For description of materials, see Table 2 on the preceding page

Table 3, the values of r and q are given for each of the tones for these six materials. The value of q, in each instance is that for a number of units of the sample that would have the thickness of one inch. A study of Table 3 shows that with few exceptions this value of q, which may be called the thickness coefficient, for the various samples is in the order of their relative densities. The value of k for any thickness, and any tone may be computed by Equation 3, so that we have a means of comparing directly the sound insulating values of these materials.

Efficiency of Paper Covering

The markedly lower efficiency of the felt as compared with materials of a not widely dissimilar character but contained between heavy paper co. ers leads to an inquiry as to the effectiveness of the paper itself in reducing the intensity of the transmitted sound. A special experiment was carried out to test this point. Heavy building paper weighing .095 pounds per square foot was tacked on one side of a felted frame, and set in the doorway between the Sound Chamber and the Test Chamber. The reduction in the intensity of sound through one, two, three and four thicknesses of paper with intervening air spaces of 1-¼", was measured.

The spaces between the successive layers of paper were then filled with felt, and the transmission of the combination was measured. This arrangement, in which the felt was only in loose contact with the paper, is not exactly equivalent to the other samples in which the filler was stitched to the paper covering. The results indicate that the combination of paper and felt is much more effective in reducing the transmission of sound than is either alone. In Figure 4 logarithm of the reduction is plotted against the number of elements, each element consisting of a doublet of felt and paper. As may be seen by comparison with the graphs of Figure 3 the combination of the highly absorbing and porous felt with the somewhat impervious paper is as effective in reducing the

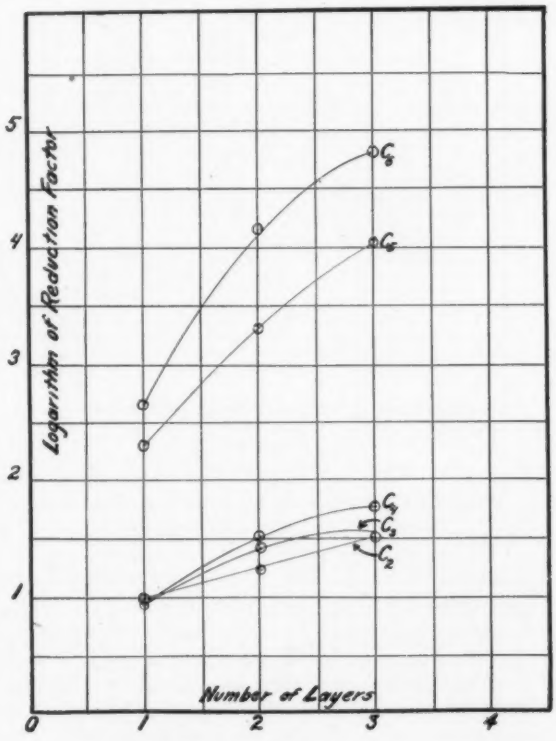


Figure 4. Reduction of Intensity of Sound by one, two and three doublets of Hair Felt and Heavy Paper

transmission of sound of the higher pitches as are the asbestos and paper combinations of half the thickness but greater mass. In Figure 5 the upper curve represents the actual logarithmic reduction of intensity of a partition consisting of four thicknesses of paper and three intervening layers of felt. The lower curve represents the values computed upon the assumption that the separate elements of the combination act independently of each other in reducing the transmission of sound. The fact that the actual reduction is markedly greater than that computed, especially for the higher tones, indicates that we are here dealing with a case that is essentially different from that in which the stitching together of cover and filler makes the two act as a single unit. The departure of all the curves of Figure 4 from straight lines bears out this hypothesis. This point was noted and an explanation given in the paper by Prof. Sabine already referred to, in which a construction consisting of alternate layers of thin sheet iron and felt with an intervening air space was studied.

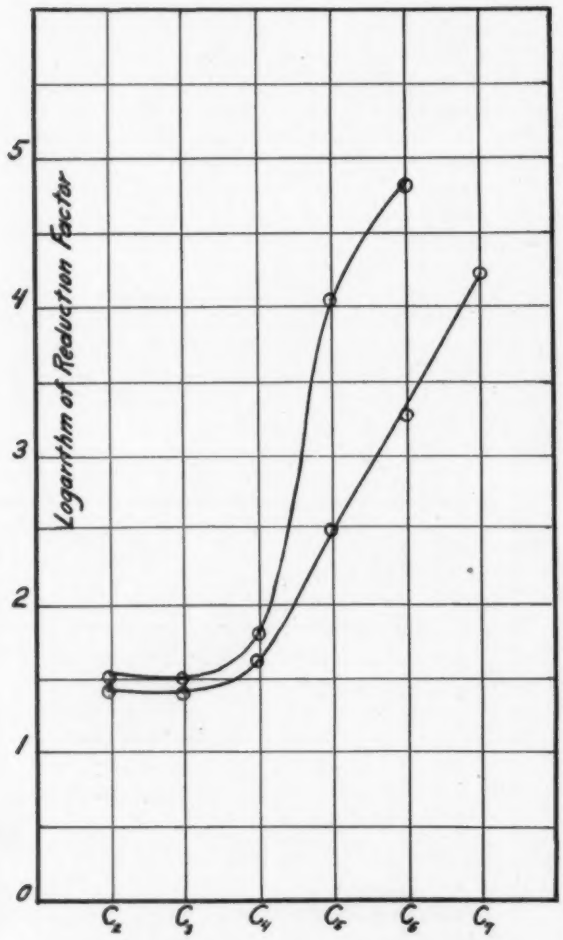


Figure 5. Reduction of Intensity of Sound transmitted by three doublets of Hair Felt and Paper. Upper curve represents the measured values; lower curve as computed

TABLE 4

Source	Pitch Vibrations per sec.	Log Intensity	Inches of Sample 8 for complete extinction
Violoncello	256	5.	5
Violin played Fortissimo	512	7.	4
Loud speaking Voice (Male)	328-1050 *	7.	4
Loud speaking Voice (Female)	328-1050 *	5.	3
Open diapason Organ Pipe speaking under 4" pressure	512	8.	4-1/2

*Note. This is the approximate range of pitch given by Professor Dayton C. Miller in his "Science of Musical Sounds" of the upper partial tones of the human voice which determine the characteristics of vowel sounds, of what he calls the first class. It was upon the persistence of these upper partials, that the intensity was computed. The fundamental tones of the voice were much lower than the frequency range given in the table and of course, different for the male and female voices. The extinction of these upper partials renders speech unintelligible.

PRACTICAL CONSIDERATIONS

There are a number of points that might well be considered in the application of the foregoing to the practical problem of reducing the transmission of sound from room to room through partition walls. Only two will be discussed.

The first is as to the meaning of the numerical values given in terms of the loudness of ordinary sounds. Unfortunately there is no means of expressing quantitatively the loudness of any given sound. Moreover, the intensity of sound from any source within a room depends upon the absorbing power of the room as well as upon the acoustic power of the source itself. Recourse must be had to examples of the numerical values of sounds of ordinary intensities. Taking as our unit the minimum audible intensity for sound of any given pitch we may express the intensity of the sound from any source in a given room in terms of this unit. From time to time measurements of this sort have been made in this Laboratory. In Table 4, the intensities in the Sound Chamber from a number of common sources is given. The values in the last two columns are of course only rough approximations since the loudness of sound from the sources may vary widely. The Table gives a very good idea, however, of what constitutes complete insulation of sounds of these intensities.

The question as to how far the insulating efficiencies given above can be realized in actual con-

struction is one that cannot be answered at the present stage of the investigation. In ordinary practice, the sound deadening material is installed between double partitions. Acoustically, the conditions in such use must be considerably different from those under which the present experiments were made. While the results of the investigation so far may be safely used in settling the question of the relative merits of materials of this sort, it is not possible to predict the actual effectiveness of any of them when used in a particular type of wall construction. The mode of supporting the sound deadening material, the separation of the double walls, details of construction, all enter into the problem, and must be made the subject of careful investigation before we can say with certainty that this means of increasing the sound insulating properties of partition walls is sufficiently effective to justify the increased cost entailed by the use of materials of this type. The results of the actual experience in attempts to reduce the transmission of sound in buildings are of great value in suggesting the most promising lines of investigation, and to this end, opinions and suggestion of those interested in the practical aspects of the problem will be welcomed.

Meanwhile a parallel investigation upon the transmission of sound by partition walls of standard types is being carried on. The ever increasing congestion of living and working conditions of modern life, the rapid multiplication of mechanical devices, with their inevitable noise and the consequent wear and tear upon nervous and mental power, make the problem one of vital importance and would seem fully to justify the time and labor necessary to secure the quantitative data required for its solution.

The End.

First Baptist Church Providence

(See reproduction of original drawing by O. R. Eggers on opposite page)

PROVIDENCE, Rhode Island, may be said to be the first home of the Baptist Church in America. The congregation which now worships in the church so admirably shown in Mr. Eggers' sketch, comprises among its members many of the descendants of that first congregation which, in 1638, organized this church, under the ministry of Roger Williams.

The church illustrated on the opposite page is similar in design to many of the so-called two-story meeting houses that adorn New England villages and cities and which suggest, in every line, the devout spirit that has for so long a time maintained this church and zealously guarded its traditions.

FIRST BAPTIST MEETING HOUSE, PROVIDENCE, R. I.
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·EDITORIAL·COMMENT·

Unemployment And Wages

THE man out of a job shares today the front page with the latest news of municipal investigation and the most recent sensational "hold-up." He decorates the lawns of city parks, where with a newspaper for a mattress, he snatches some moments of sleep, and during waking hours, poses as "human documents" for political parties struggling for control. Professional reformers of various ranks and wide ranging abilities, are rushing into print. The "high-brow" analyst, from the seclusion of his study, has long since given to the world what he feels sure is the only true remedy for the evils of unemployment.

The Government, as represented by those connected with high offices, positively assert that they are ready to launch a remedy and confidently assure all the people that at least a million of the several million unemployed will at once be found jobs.

Organized labor is not loud voiced in the present discussion. From the standpoint of labor unions, it is unwise to discuss the wage question. The shrewd, far-seeing labor leaders undoubtedly know it is the very cure of the unemployment question. It is absolutely useless, as it is utterly misleading, to consider the question of the large numbers of unemployed without making wages the chief matter of investigation.

If labor showed the same unwillingness to discuss the problem of wages as affecting all the people and not specifically in its relation to organized labor, it would beget confidence, restore stability, and inaugurate an instant resumption of every stagnant industry.

The New York *Herald,* editorially commenting on the present situation as to unemployment, very wisely stated that if labor would seriously discuss ways and means of revitalizing business, it would be a "consistent building from the bottom up. All other methods of approach to the unemployment problem are but the footless efforts to build from the top down."

WE have made many economic blunders during these days of reconstruction, and we should profit by our errors. It would be nothing short of an economic fault to create unstable conditions and then call on the unemployed to go to work.

The many enterprises now standing still, and industries halted,—building, for example,—naturally throws vast numbers out of employment.

Any one of the many theories advanced, that does not take into first consideration the question of wages, is but a further example of economic blundering.

When the question of wages has been so definitely settled as to create a condition of reasonable stability, there will be a humming of the wheels of industry so loud and so steady as to drown out the theoretical arguments that are now complicating an already grave condition and getting us no further on the way to a solution of this vexing problem.

IN Great Britain men out of employment have been regarded as unfortunates whom it is the duty of the more fortunate to support until the return of better times. So generous has been the aid that competent observers say many thousands of men are receiving each week almost the wages of ordinary laborers. When offered work they refuse anything not directly connected with some trade in which they claim to be proficient and which happens always to be a seasonal trade, the season of course several months past, or to come. The result of unemployment doles led Mr. Bramwell Booth of the Salvation Army to write a letter to the London Times, in which he said among other things, "I do protest that paying for nothing is all wrong * * * * * * *. If we must pay, and it is evident we must, let us pay for work. One of the most serious dangers of the dole age in which we are living is the weakening of the self-respect and sturdiness of the working people. To be paid to do nothing is, economically and socially, bad enough, but to be willing to be paid to do nothing, that is far worse."

Bramwell Booth is one of the most practical and experienced sociologists in the world, the friend and counsellor of human flotsam and jetsam, the "down and outers," victims of intense commercialism. For such a man to protest that the way to aid men out of work is to give them work and not financial aid except as payment for work is significant. He is ably seconded by another man, Herbert Hoover. He said "The cure for unemployment is employment." It is quite possible Mr. Hoover paid small attention to human beings as individuals until his reputation for competent direction of large enterprises led to his selection seven years ago to head the Belgium relief work. He knows that self-help is the best help.

JUDGE Landis did a good work in Chicago in refusing to act as Arbiter between the associated employers and the associated laboring men until each side cleared its respective working agreements of clauses inimical to the public interest.

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That a large number of the laboring men refused to abide by their promise to accept his rulings does not in the least impair the value of the work he performed. It is late in the season and during the winter arrangements will undoubtedly be made to start work in the spring along the lines indicated in Judge Landis' decision. The resumption of the building industry will do more than any single thing to reduce unemployment and start again the wheels of industry. Man's inhumanity to man is well exemplified in the present stand of organized labor on the question of wages. Prices are on the downward path in every line except house rentals and rents will come down when the supply of houses is adequate. Prices have fallen because of a "buyer's strike" caused by the inability of people to pay high prices as so many are out of employment and those fortunate enough to be employed are earning less than they were a year ago, that is, those who are not members of unions who are holding to war-time wages. Reliable reports indicate that the unions holding out most strongly for high wages number many unemployed and the refusal to abide by agreements entered into with arbitrators will cause many more to be laid off.

A willingness to accept the inevitable will cause a boom in building and in time will react favorably on every trade and calling. The money is in the banks waiting for some brave men to take a chance and ask for credit in order to resume business. It is fine to theorize but it is feared that this period of depression will end as have all others. They recur periodically about twice in a generation. The cry of the unemployed brings forth many suggestions, some of practical nature, but nothing is done until an actual shortage in certain goods leads a few adventurous manufacturers to try and capture the market. Their competitors follow and the money spent in wages by the employes gets into circulation. Prices rise and then fall as the market becomes saturated. There exist today underproduction of many things coupled with underconsumption of the things to be had in the market because those who might produce are idle and have not the money to buy the things of which there is a plenty. A survey of the country to determine wherein exists the greatest deficiency of goods shows that in the building industry exists the salvation of all business. The unions of building trades workmen hold the happiness of millions in their keeping. If they will agree to a reduction in pay to start things going there will be such a demand for their services in the near future that pay will again rise in response to the law of supply and demand.

PUBLISHER'S ANNOUNCEMENT

The Memorial Quadrangle at Yale University, New Haven, Conn.
James Gamble Rogers (Yale '89) Architect

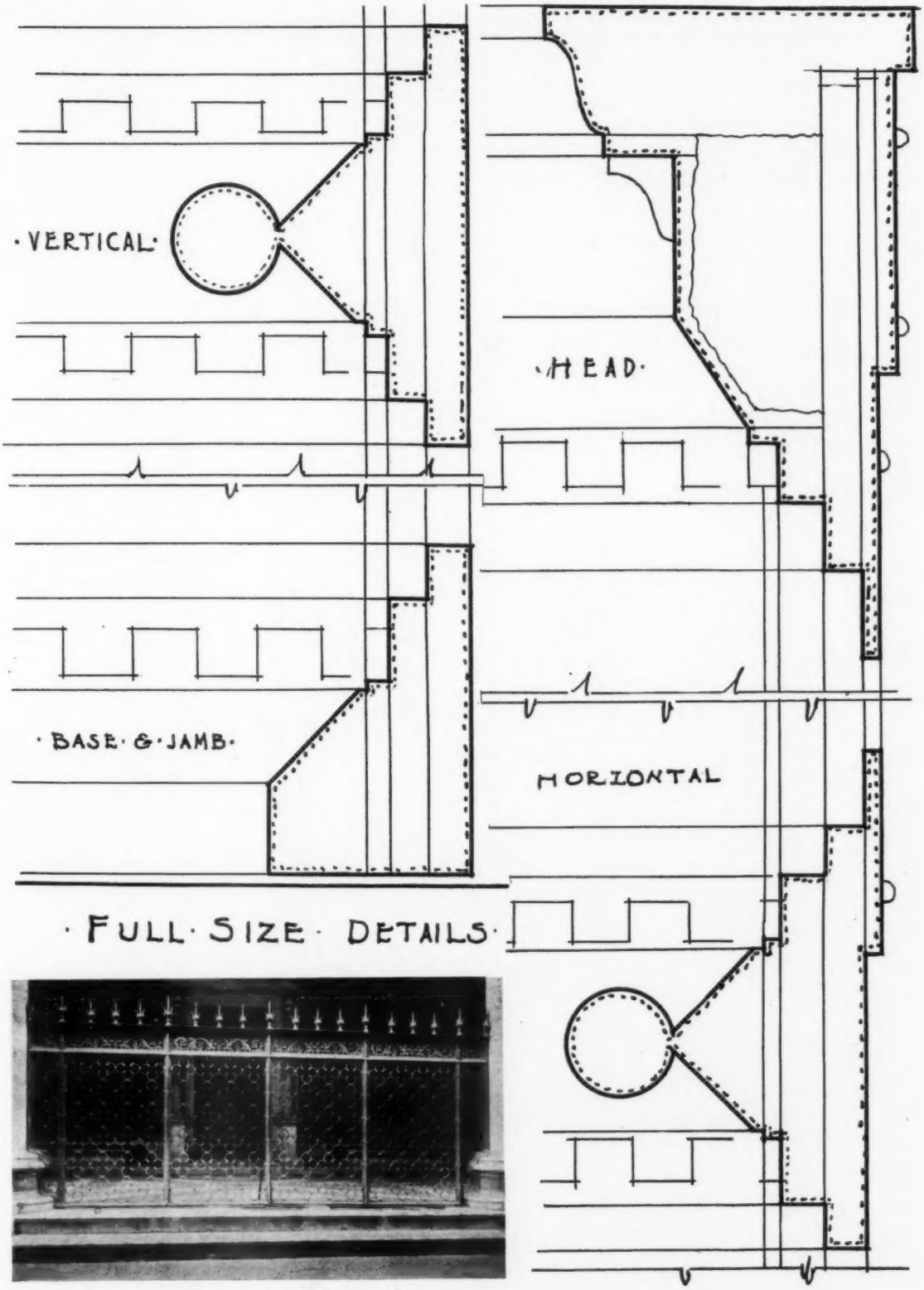
THE AMERICAN ARCHITECT and The Architectural Review will, in the issues of October 26 and November 9, illustrate the Memorial Quadrangle at Yale University, New Haven, Conn.

Believing that the architectural importance of this unusual group of collegiate buildings makes necessary the most authoritative and painstaking presentation, there has been no effort to secure priority of publication, but to present to readers of this journal the most complete illustration and description of these buildings that would be possible.

William H. Goodyear, M. A., Yale '67, Curator of Fine Arts, Brooklyn Museum Institute whose studies in Temperamental Architecture are familiar to the profession of architecture everywhere, will, in the issue of October 26, present an exhaustive analysis of the architectural features of the Quadrangle.

In the issue of November 9, James Gamble Rogers, the architect of the Quadrangle, will contribute an article.

Many of the illustrations have been made exclusively for these issues, to which have been added illustrations that have appeared at different times in the numerous publications of this collegiate group. In order to have a complete record of the buildings, it has been thought desirable to include a certain number of the better views heretofore shown.



WROUGHT IRON GRILLE, LOGGIA DEI MERCATI, SIENA, ITALY

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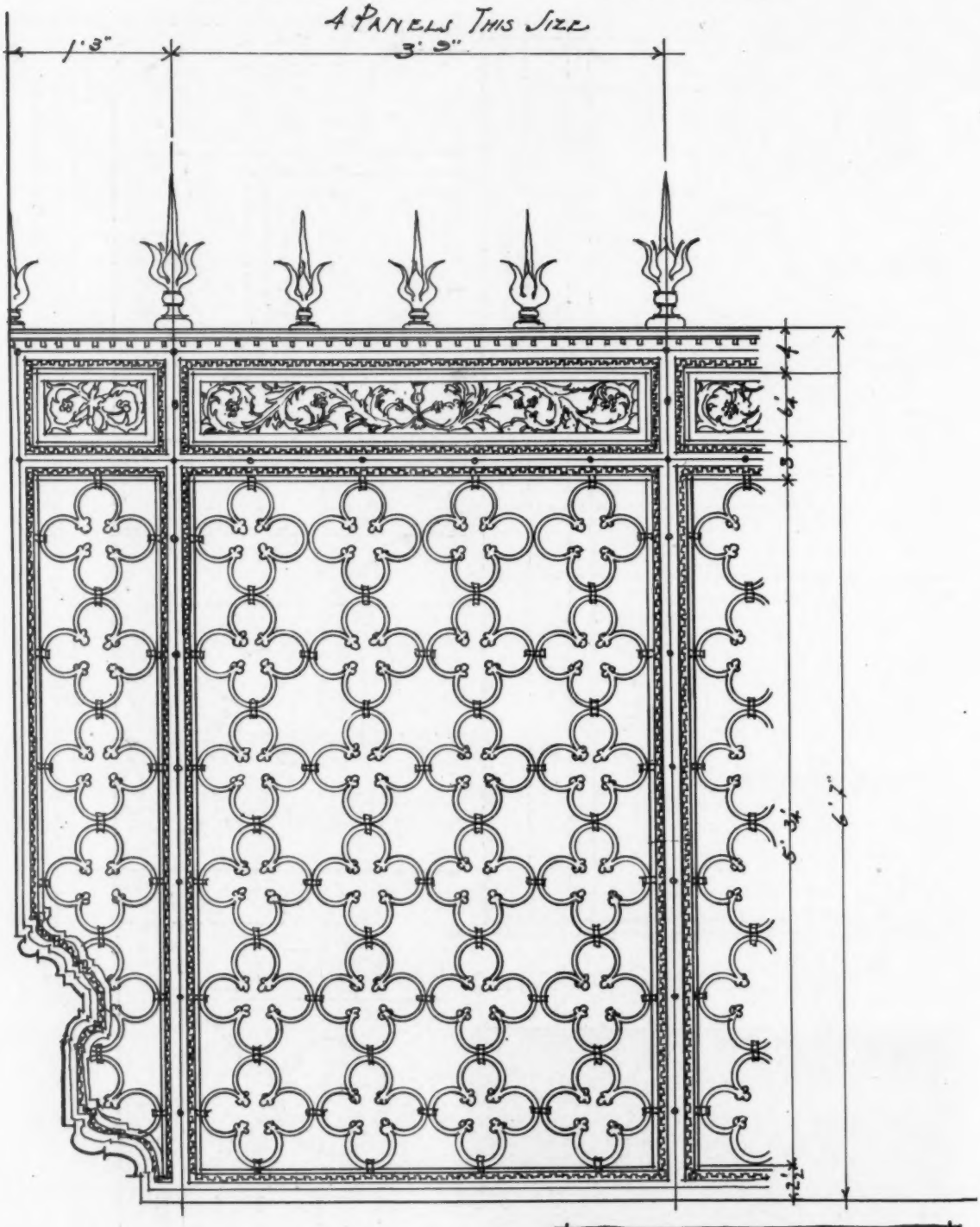

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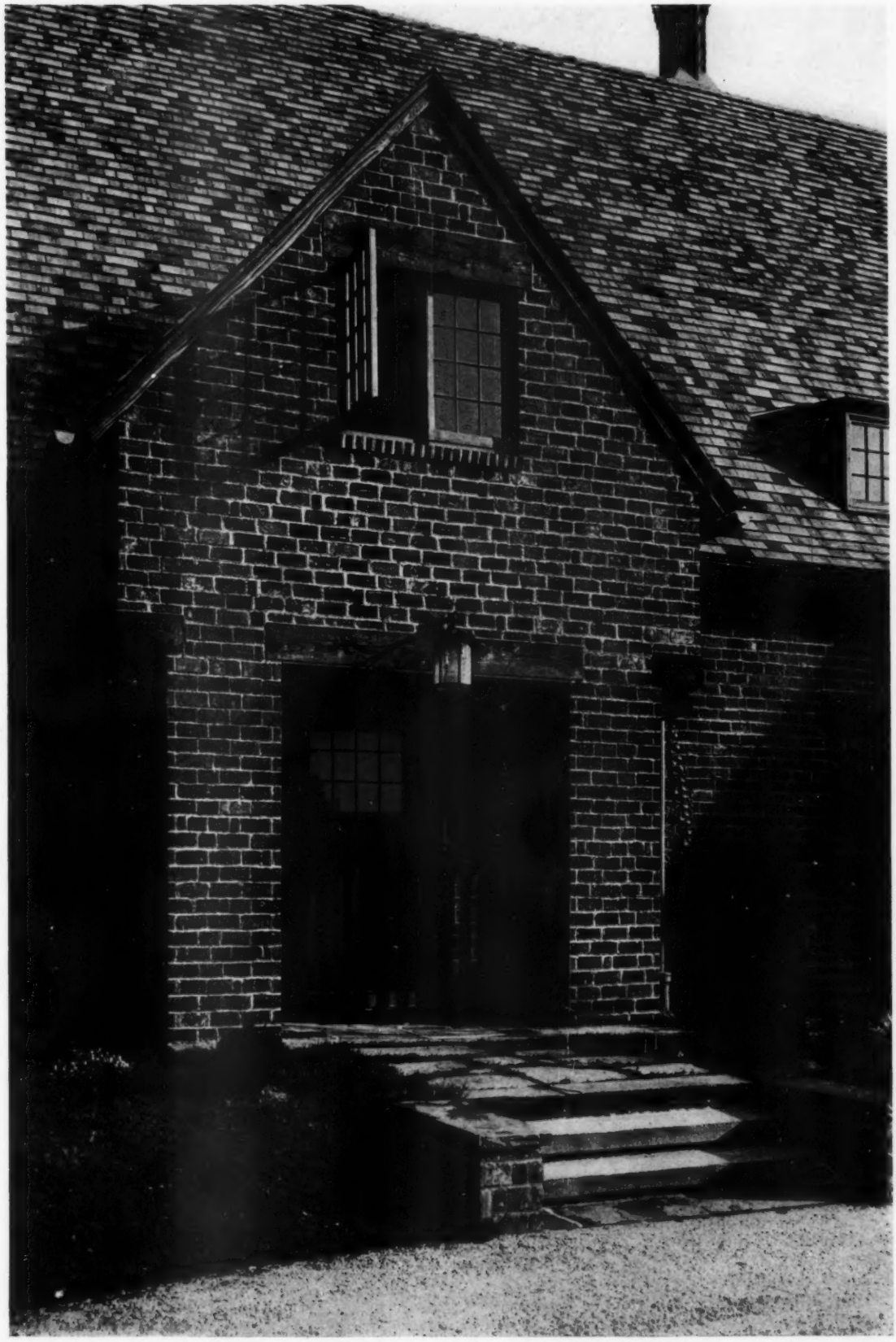

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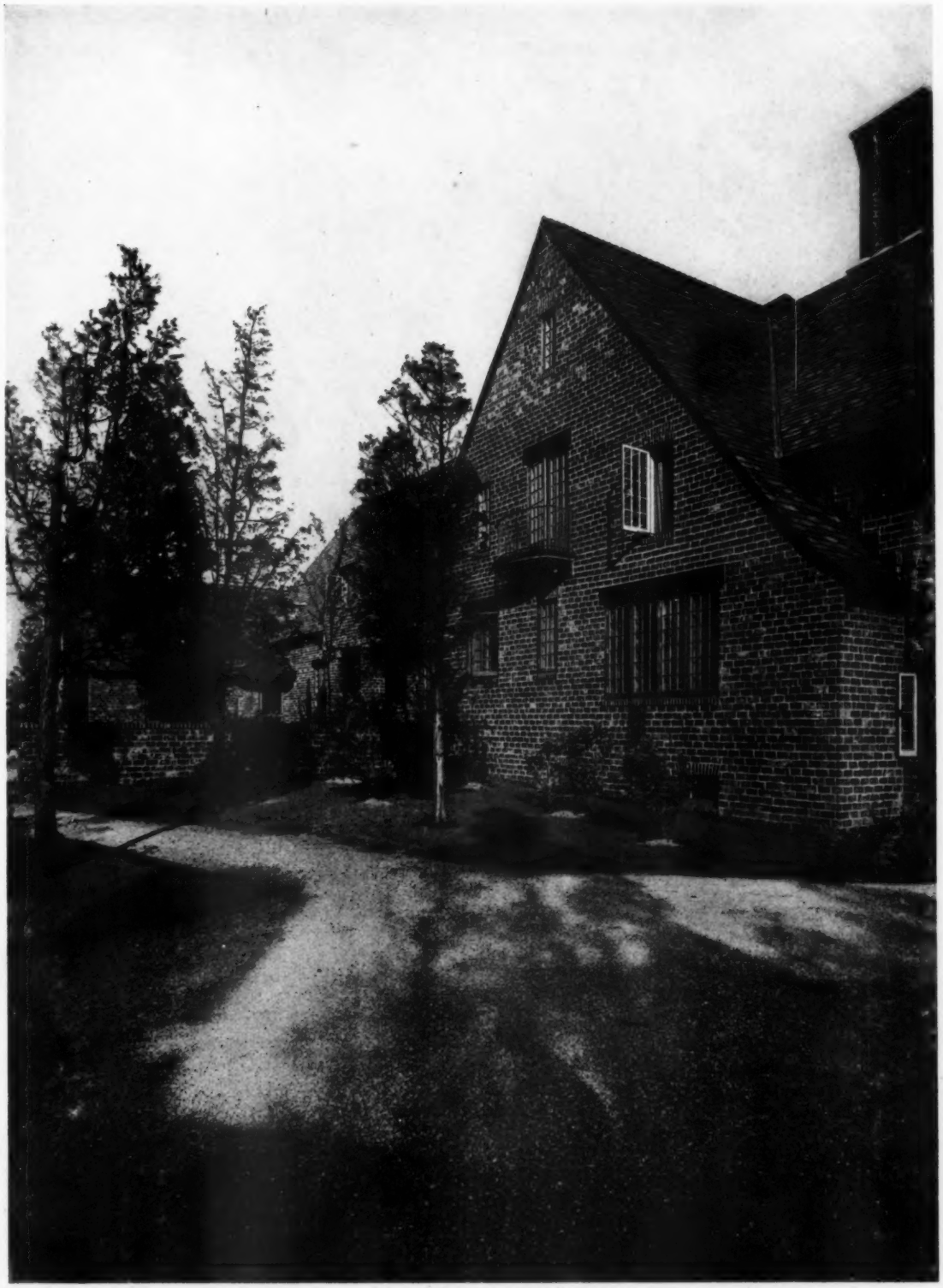

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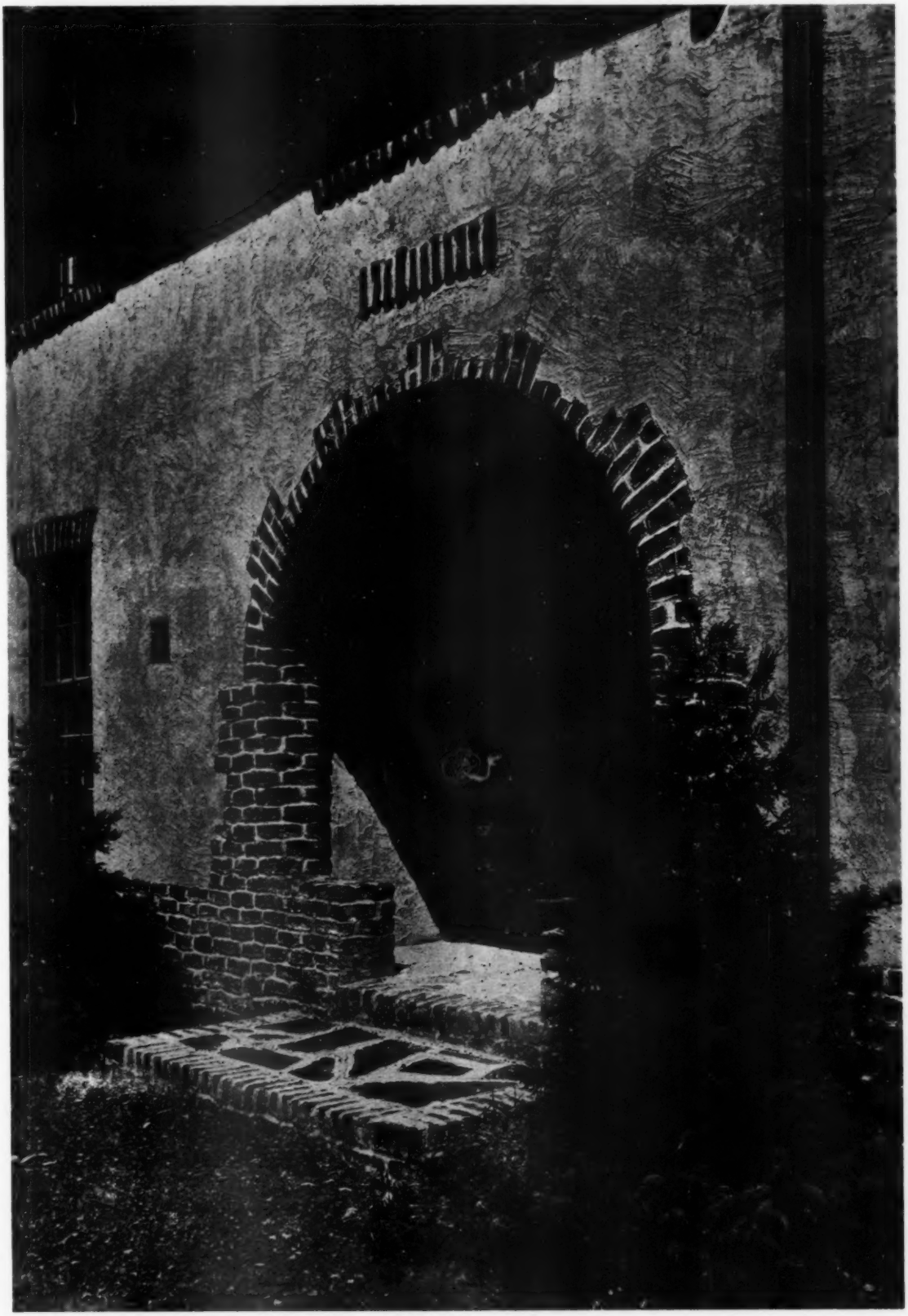

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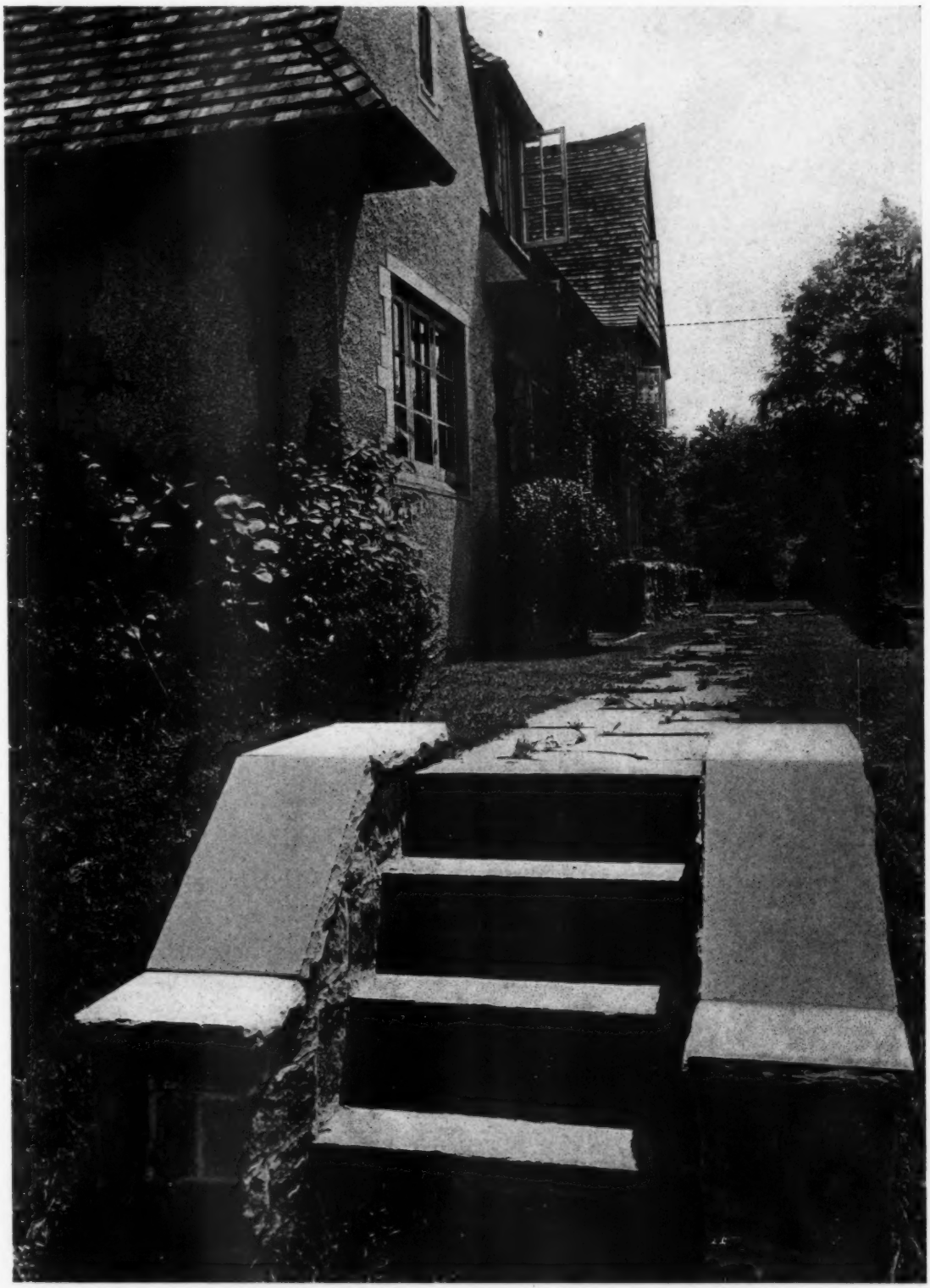

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DETAIL OF GARAGE AND SERVICE WING

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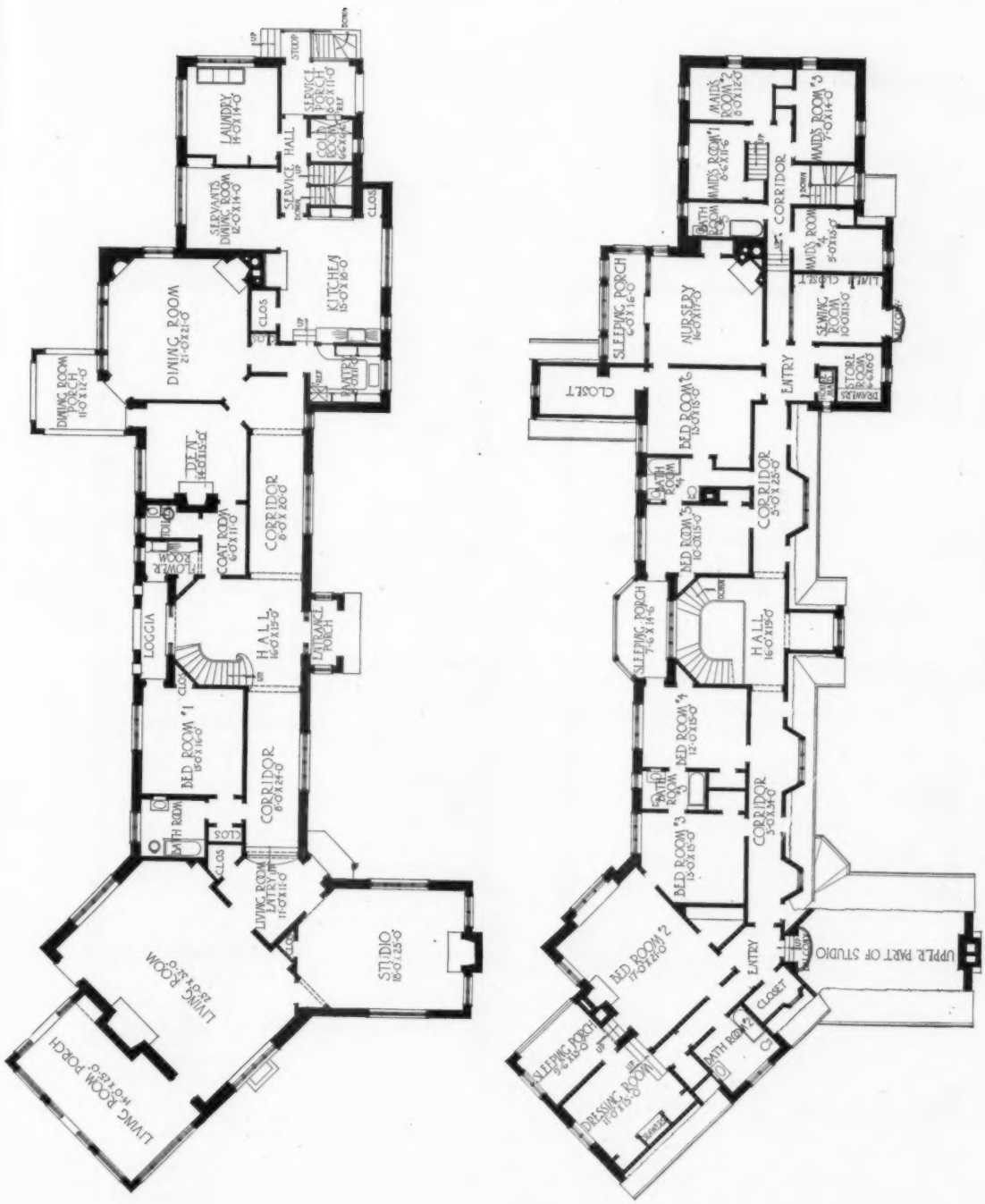

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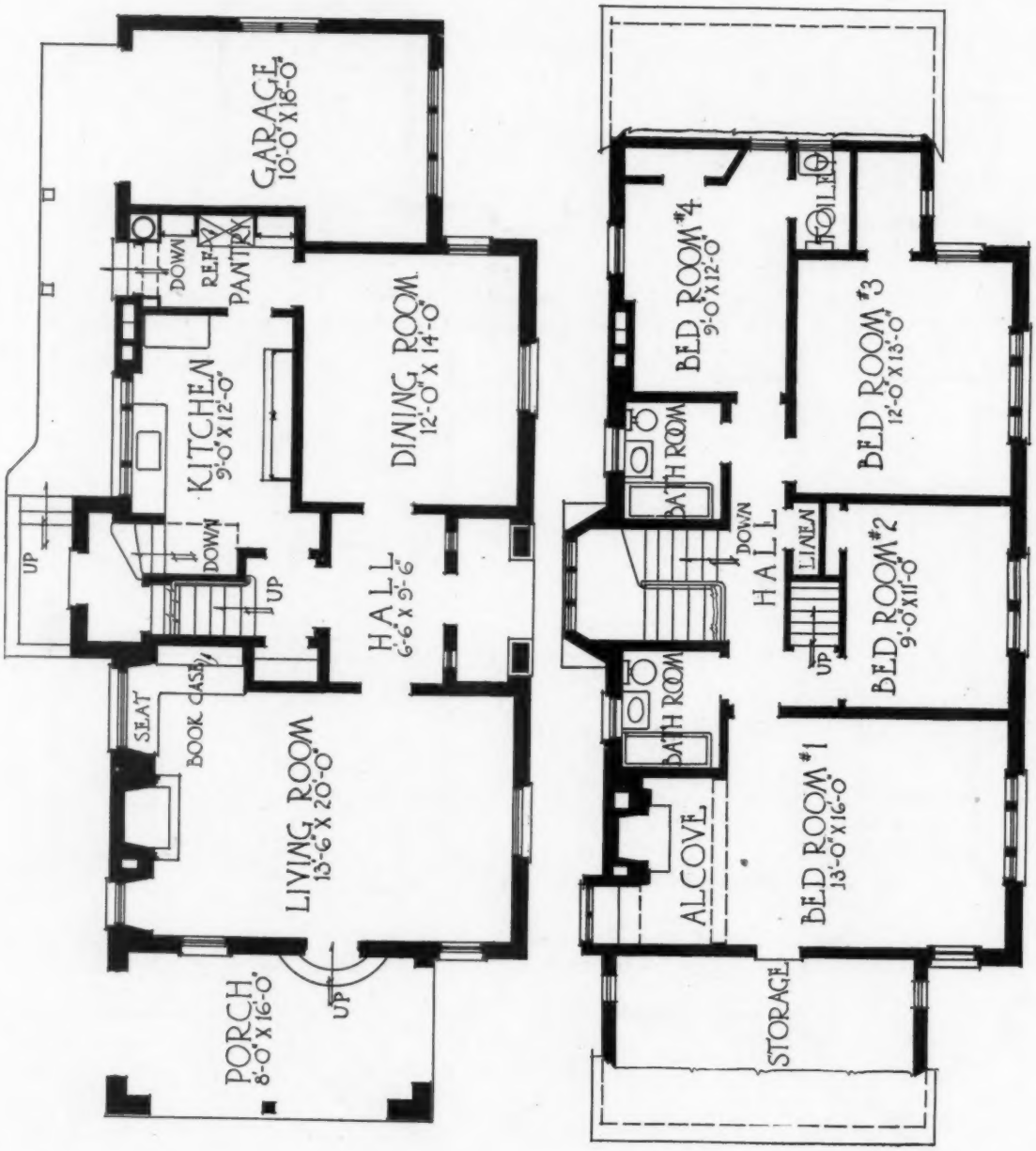

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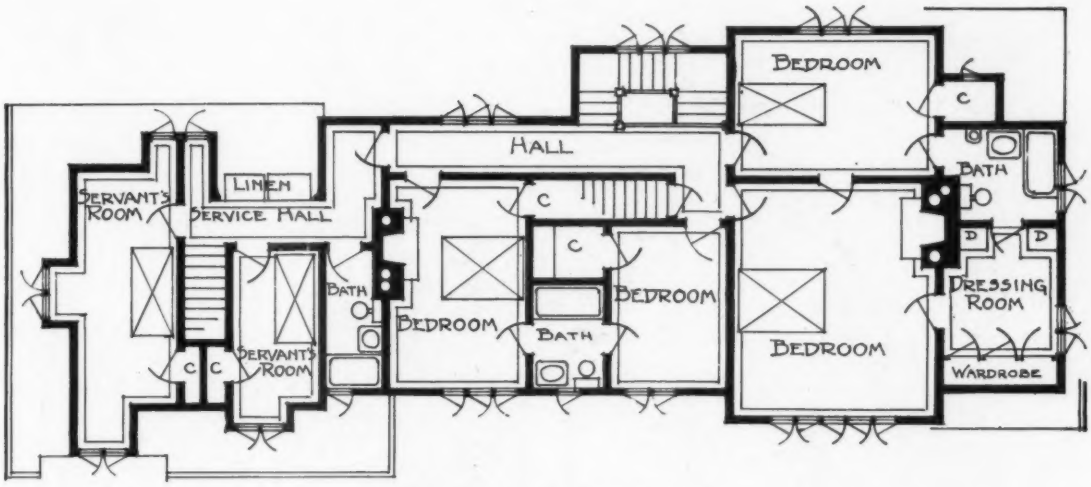
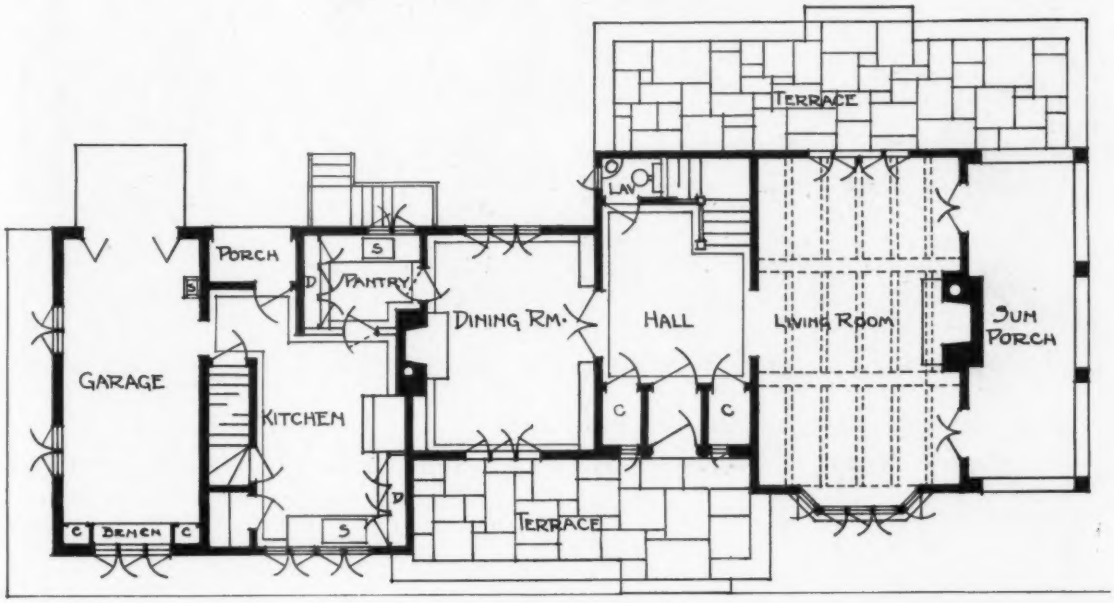


SECOND FLOOR PLAN



FIRST FLOOR PLAN

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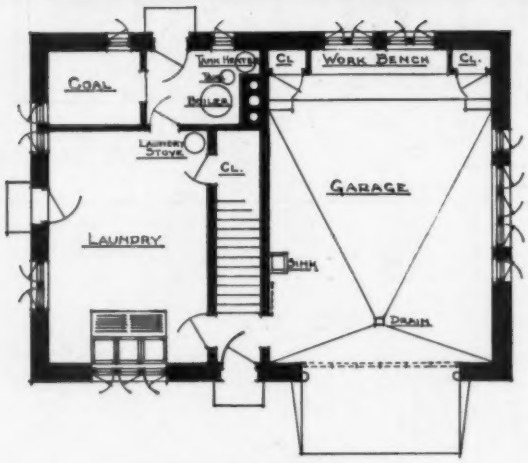
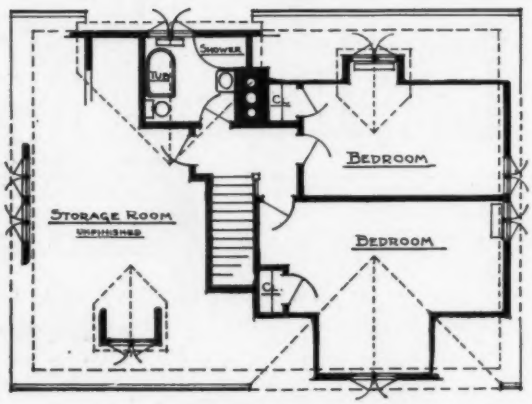


First Floor Plan



Second Floor Plan

GARAGE OF W. A. BOSTWICK, LAWRENCE PARK WEST, N. Y.

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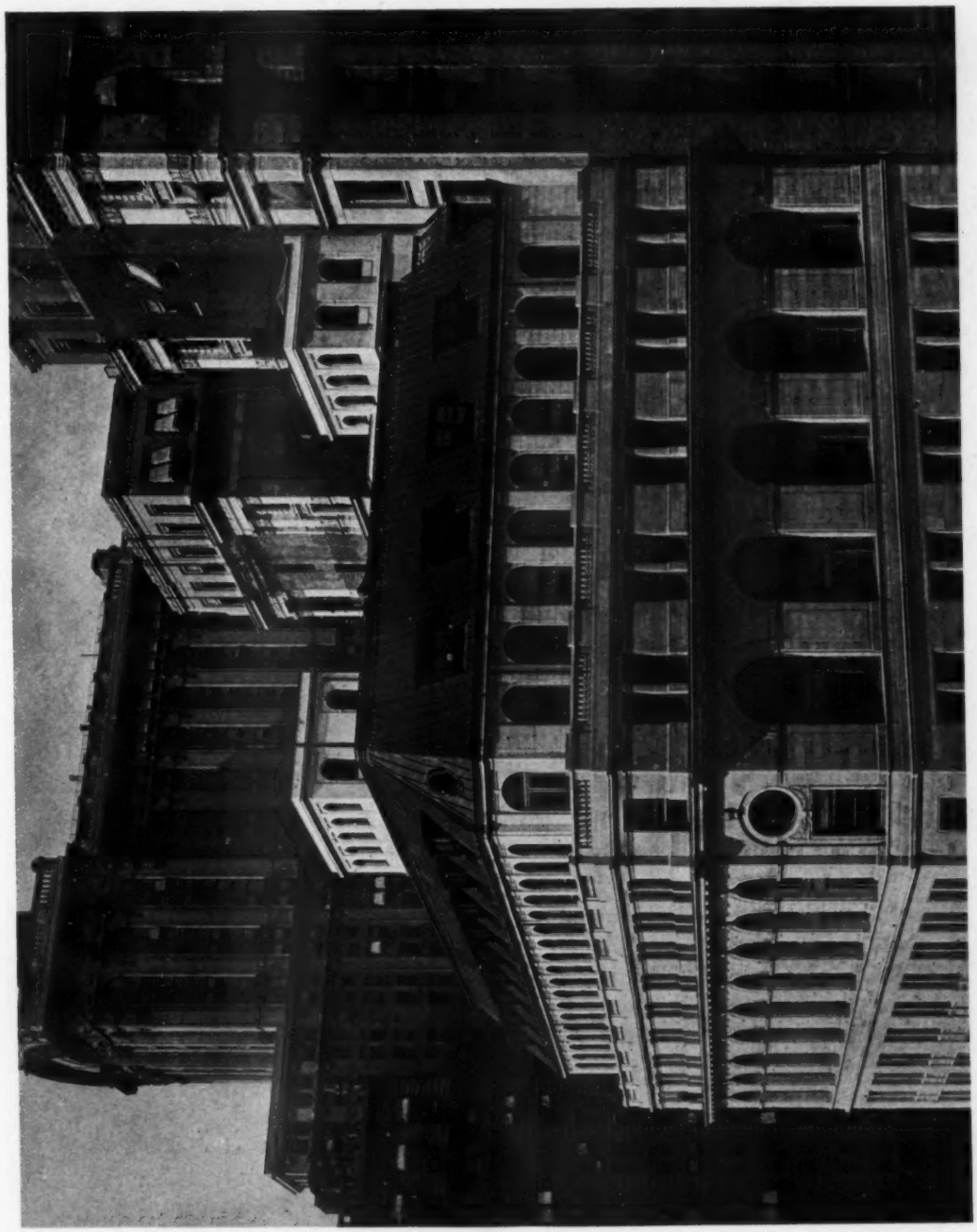

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THE ROOF AND ITS SETTING AS AFFECTED BY THE ZONING LAW, REPRESENTED BY THE SURROUNDING BUILDINGS

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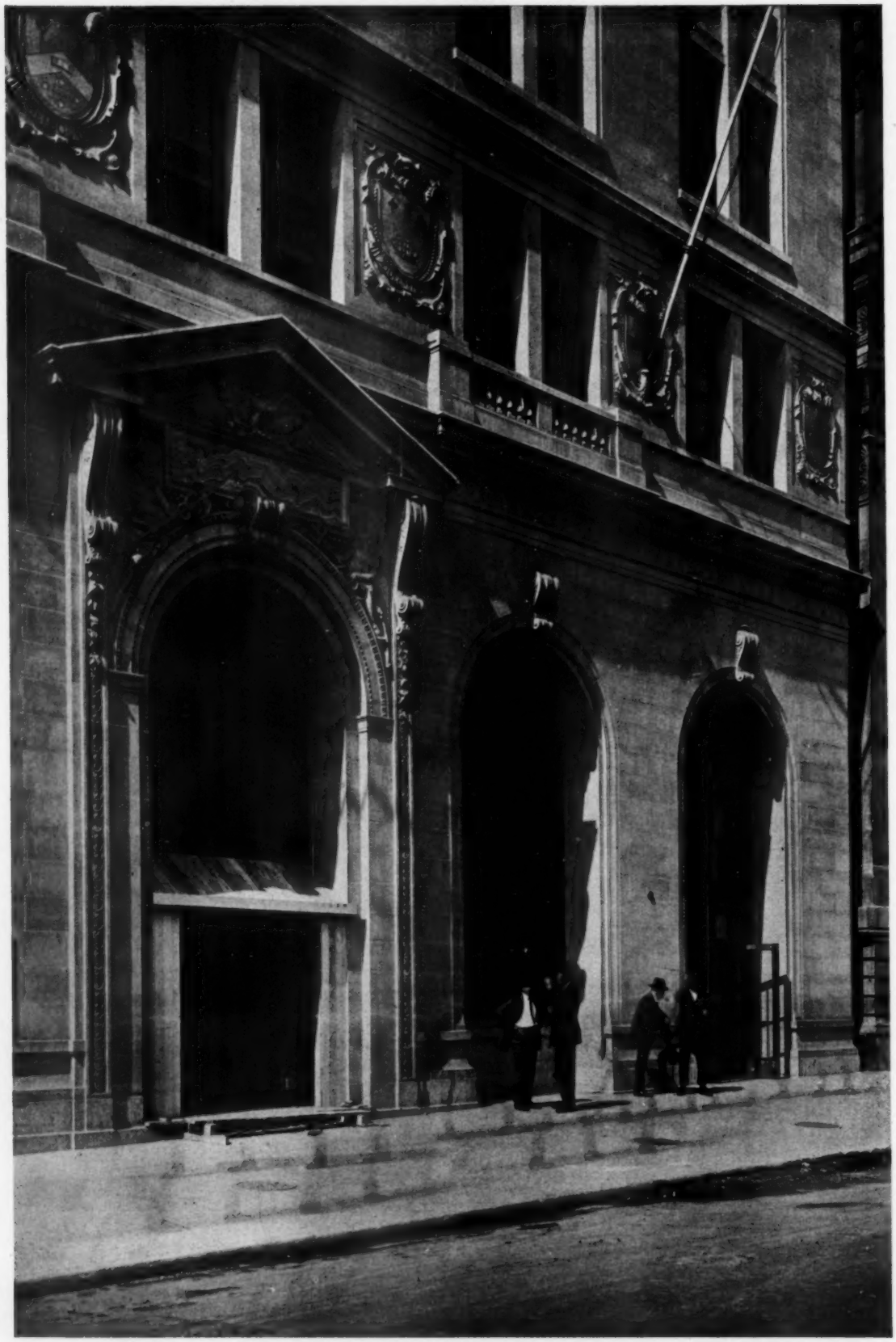

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DEPARTMENT OF SPECIFICATIONS

IN previous issues of *The American Architect* this department has expounded certain principles governing the work of a specification writer and has suggested rules of procedure that have been found quite successful in actual practice.

These discussions have had particular reference to the qualifications of the specification writer, his office equipment, the construction or formulation of the specifications and their composition. We should now have well fixed in our minds the kinds and quality of attributes that seem fundamentally necessary in the successful accomplishment of the duties of a specification department.

With this groundwork thoroughly understood, it is logical to proceed with a study and determination of the succeeding processes of the work. In many of these suggestions (and also in some of the suggestions that have been put forth heretofore) there may be found a tinge of idealism that may seem almost impossible of attainment. However, in order that there may be standards of some sort, it is proper to make them ideal in many respects, with the hope that the goal may some day be won.

The specification writer, as has been suggested, should be active from the time the preparation of drawings is commenced, lending his advice and counsel in the general preparation to undertake the work in a systematic manner. The first step that should be taken is the direction of the survey of the ground. It is universally recognized that an accurate survey is quite essential, especially where a building is to be erected between two existing buildings or where the greater part of the work is the remodeling of an existing building. The matter of a survey for a new structure will be discussed first. It will be assumed the building is to be erected in a distant city.

The surveyor who is selected to do this work should be a man experienced in obtaining the information necessary for use in building construction. If such a surveyor is not known a request to the local city engineer or county surveyor will usually bring a recommendation which, in most cases, may be relied on. A list of instructions, embracing questions that must be answered for all work and questions that have particular application to the operation at hand, should be prepared and sent the surveyor. These instructions and questions will cover the following points:

1. An exact copy, without abbreviations, of the legal description of the property as given in the deed or deeds.
2. A plot plan of the property and of sufficient of the adjacent properties and streets, alleys, courts or other public places contiguous or in which there may be public utility systems that may serve the building.
3. Copies of all state or local law, ordinances, rules or regulations that have to do with building construction, sanitation, fire prevention, electrical equipment, occupancy (either temporary or permanent), of adjacent public highways and rules and regulations of all public utility companies.
4. Character and composition of sub-soil to a depth of at least fifteen feet below the bottom of the deepest footing. The best practice will be to have test borings made at each corner and at points on bounding lines midway between the corners. Samples of the borings should be taken for each foot in depth and these samples kept for future reference and not thrown away before the foundations are placed. Diagrams of each hole should be made, showing the soil conditions at various depths and their location noted on the plot plan. In addition, the engineer should report what soil loads were used for recently constructed buildings in the immediate vicinity, and give the name of the owner or architect or other responsible person with whom intelligent correspondence could be had respecting soil conditions. For buildings of one or two stories test holes probably will not be necessary, in which case the judgment of the engineer can be relied on for guidance. The engineer also should make note of any rubbish fills, sloughs, water courses, springs, tunnels, sewers, wells or deep holes in the sub-soil, with complete data as to all such conditions. Also the ground water level should be determined, particularly in clay or stone, and an indication of the chemical composition of the water.
5. Ascertain from authorities having proper jurisdiction if steps, belt courses, cornices, open areas, etc., are allowed to project beyond the property line. The discovery of such restrictions should be made separately from the study of the local building laws.
6. Report as to all available aggregates for concrete. Samples of the sand and stone or gravel should be sent in. If these materials must be shipped in from other places, give the names and addresses of at least two shippers of such material.

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7. Give the size and color of common brick, state whether it is made of clay or shale, determine its absorption percentage and note whether of local manufacture or imported. If imported state from whom. Send in an average sample without attempting to secure the best brick in a pile.

8. State whether good steam boiler cinders are available locally and, if so, give their source of supply.

9. State whether there are two sewers, i. e., one for sanitary wastes and one for storm water. Will back water valves be required?

10. Give complete details as to water supplies, especially average pressure, meter requirements, possibility of use of water for hydraulically operated machinery.

11. Give complete details as to gas supply, especially whether natural or artificial or if both are available, average pressure and metering.

12. Give complete details as to electric light and power service, especially whether direct or alternating, system of wiring, voltage, phase, cycles, metering, minimum horse power for power use for which a power connection separate from lighting connection will be provided.

13. Give complete details as to telephone service, electric-clock service, watchman's service, telegraph call service and all conduits that must be provided to accommodate wires of these services.

14. If there is a district heating plant that may have service available for the building, give complete details of such service.

THESE questions should be written on standard letter size sheets, sub-divided as may seem necessary and amplified as the judgment of the specification writer dictates. The surveyor should be instructed to answer each question in as great detail as possible, giving any supplementary information that may seem desirable or applicable to the work in hand. The answers should be made on the same size sheet and should be numbered corresponding to the numbers of the questions. In many cases it would facilitate matters if the surveyor is told what kind of a building is to be erected and is given a rough plot plan showing the approximate ground area. If it is possible to approximate the demand for water, gas, electricity, telephone and other public utility services the surveyor should be made acquainted with such probabilities in order that he can more intelligently confer with the various officials and provide all information that may be of use in studying the preliminary layouts.

The plot plan, or survey, of the property as prepared by the engineer should be made on tracing cloth with "north" at the top of the sheet and the orientation indicated by arrow marks. This seems elementary to many specification writers, yet this requirement should be emphasized as it is annoying to discover that the usual assumption as to orientation is erroneous with respect to a particular survey as there are some surveyors who disregard this primary rule. The dimensions should be given in terms of feet and inches, using the English rather than the decimal system although the lines may be laid out in accordance with the decimal system customarily used by surveyors.

The surveyor should determine a datum level for vertical measurements. If the city has no established datum level, then it will be convenient to locate this one hundred feet below the level of the sidewalk at the main axis of the building, unless the foundations are to extend down below the one hundred feet level, in which case a level two hundred feet down will suffice. In this connection a bench mark should be established on some permanent nearby landmark that will not be obstructed or harmed by the subsequent building operations. It preferably should be located on some building across the street and not on a trolley or wire pole, mail box, fire plug or lamp post that may be removed before the use of the bench mark becomes necessary.

The plot plan made by the surveyor should have indicated on it the following items:

15. The exact dimensions of the property. These dimensions should be checked from the direction opposite to which they are first determined to ascertain if the position of the lines is coincident, no matter from which direction the survey is made. This word of caution is interposed for the reason that in one survey the front width of a certain property, when chained from an intersecting street corner to the south, was one hundred feet while, when chained from the north intersecting street, it was one hundred feet and four inches. In this case it was necessary to make a re-survey of quite a large district to remedy the error that had been made by a surveyor about sixty years previous. The re-check always should be made when the deed reads somewhat as follows: "All of lot 'A' and the south twenty feet of lot 'B'," as there is expressed a width of lot that can only be determined by an exact survey.
16. Measurements of all angles of property lines.
17. The widths of all contiguous streets, alleys, courts, areas and walks.

18. Elevations of abutting walks or curbs at all corners of the property. Where alleys, courts or areas abut the property, the elevations at the property lines also should be given. These elevations should be checked by the proper city authorities and if the city desires the elevations of new work raised or lowered the official new elevations should be noted. Also show pitch of walks as required by city.
19. Locations of poles, hydrants, lamp posts, mail boxes, street drainage inlets, sewer or water manholes or other public utility equipment that presumably must remain.
20. Locations of car tracks in streets.
21. A cross-section of gutter flags and curbs and notes as to materials used.
22. Indications of marks for all property lines and the permanent bench mark.
23. A layout of basement and foundation walls of the existing buildings, with sidewalk areas or sub-sidewalk spaces carefully described and notations respecting materials that compose all of this old work. The extent of existing excavated spaces and the nature of masonry or other work that must be removed should be understood by the contractor excavating for the new structure.
24. Drawings showing the profile of all walls of adjoining buildings that are on the property lines or are fairly close to them. If party walls are in existence and they must be considered for the new structure, complete information as to their construction and the loads from the adjoining buildings that they support. If statutes or ordinances fix a level below which the constructor of the new building must shore, underpin or otherwise care for the adjoining walls, indicate this level on these profile drawings and make note of concentrated loads that must be given especial shoring attention.
25. In the case of party walls indicate their position exactly and note whether the front wall of new building is to overlap these walls. In any case make a drawing of adjacent parts of front walls of adjoining buildings, with heights of belt courses, cornices, parapets, etc., carefully shown.
26. Note positions, diameters, flow directions and depth of all sewers.
27. Note positions and sizes of all water mains.
28. Note positions and sizes of all gas mains.
29. Note positions and sizes of mains for district heating service.
30. Note positions and nearest manholes of any underground electric light and power, telephone, telegraph or similar electric services.
31. Note all existing sewer, water, gas and electric connections and give their sizes and state whether they could be used for new structure if desired.
32. Note points of entrance of all overhead or underground services such as water, gas, electricity, telephone, telegraph, messenger call, clock, etc. after consulting with officials of interested companies.

IT is very possible that experience will supply additional points that should be taken up for consideration at the time the survey data is assembled. Each operation should be studied, especially where it is in a city at some distance from the office or if it is necessary to send to such a city a surveyor whose services are too expensive to warrant frequent trips for re-surveys or for amplification of the data originally obtained. At the time the survey is ordered the sketches should have been developed sufficiently to enable the architect to determine the main points that are to be considered and to prepare a schedule of the matters additional to those appearing above. It seems trite to say that no building operation of any consequence should be commenced without a very carefully drawn survey, especially when the building is to be built to the lot lines.

Particular attention always should be given that part of the work that relates to available local materials, their kind, quality and usability for the work contemplated. The disregard of available local materials that is evident in many specifications would be laughable were it not for the fact that the laugh is always on the architect, thus discrediting his professional acumen to a certain extent.

A series of photographs of the site and surrounding property should be made in large sizes and from points that will reveal all items of interest. Wherever it seems probable future needs will require more detailed information, photographs at close range should be made and their subject marked on one set of the general views.

For a survey that is to be made for remodeling purposes it is rather difficult to lay down any special rules of procedure except that all structural parts of the building should be dimensioned and fixed exactly on the various floor plans and sections. Except in extreme cases, where the known future loadings are very light, it may not be essential to uncover construction to discover these factors but a good rule is to obtain too much rather than too little information.

All measurements of existing work should be "running measurements" and not from corner to

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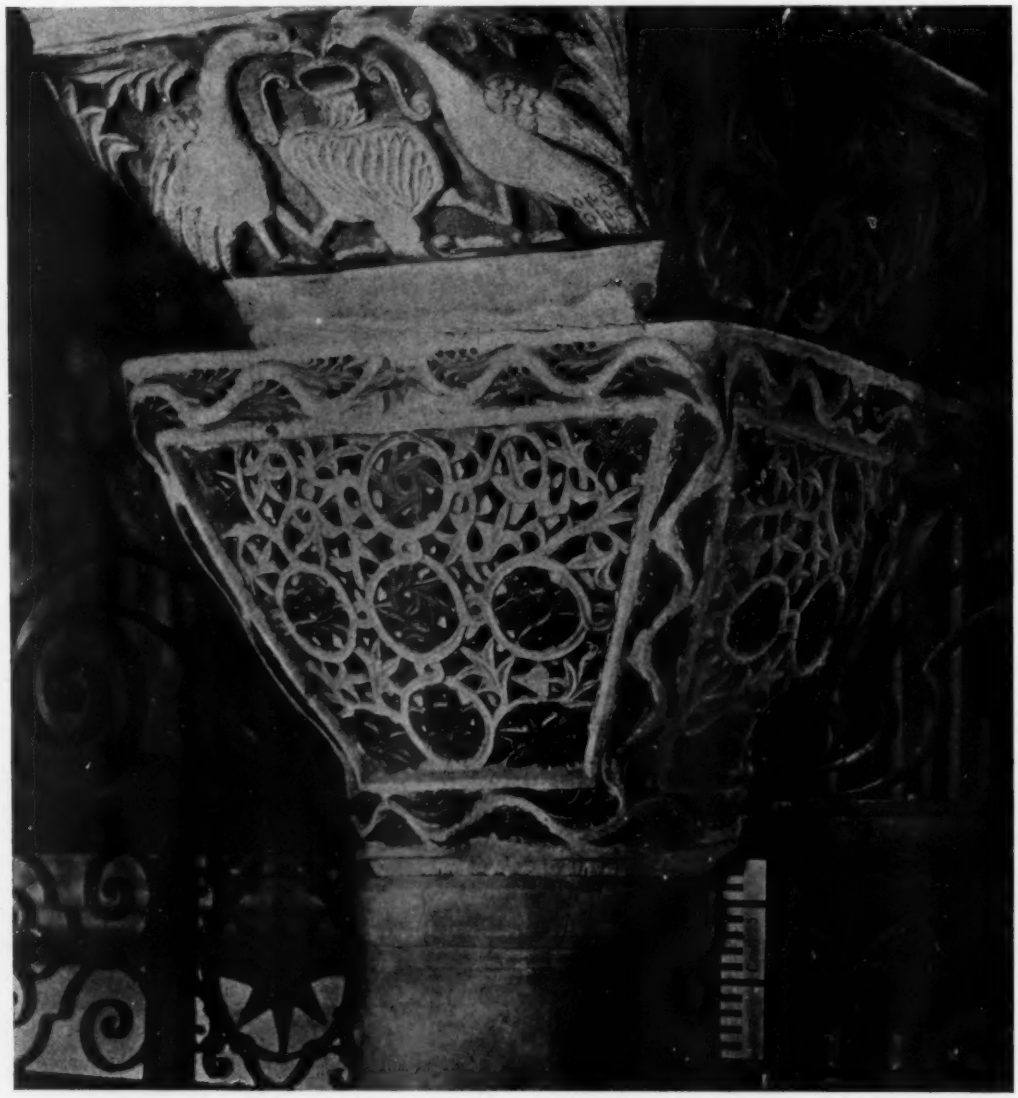
window reveal, width of reveal, width of pier, etc., as the latter method gives too many chances of errors. It is advisable to establish horizontal and vertical bench marks or station points to which all measurements for certain areas are referred.

Notes as to all public service supplies, interior mechanical and electrical equipment and, in fact, everything that can be considered parts of the building or equipment should be made in the fullest and most detailed manner.

Photographs of visible exterior walls of interiors should be made wherever possible, in order that the drafting room will have a more clear understanding of existing conditions.

All of these points have a great deal to do with the work of the specification writer and they should be given serious consideration by him or his colleagues on every operation.



Capital—Church of S. Vitale, Ravenna, Italy

DEPARTMENT OF ARCHITECTURAL ENGINEERING

NO. ONE BROADWAY

The New York Offices of the International Mercantile Marine Company

WALTER B. CHAMBERS, F. A. I. A., Architect

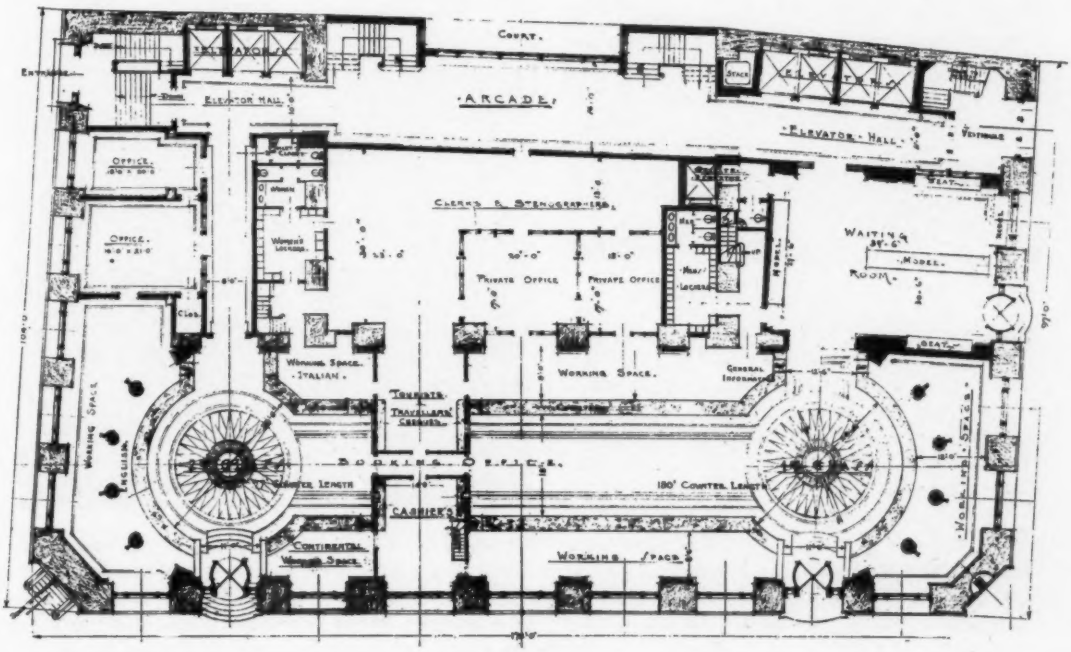
LOWER Manhattan Island, and more particularly that part near to Bowling Green, was during the Revolutionary War, the theatre of many stirring events.

When the Colonies had secured independence and the "Battery" became the social center of the city, many buildings were erected by heads of families socially and commercially prominent. From No. 1 Broadway, which forms part of the site on which the remodelled building of the International Mercantile Marine Company stands, stretching north to Trinity Church at Wall Street, every square foot of ground has its historical tradition.

Architects who plan or remodel structures in this historic locality have unconsciously assumed certain obligations and may be said to approach their work under the dominating influence of what, for the want of a better locution, might be called "historical perspective."

The site of No. 1 Broadway overlooks on the Broadway side the old market place and bowling green of the early settlers, and to the south the site of the first fort in New Amsterdam, and the Battery.

Peter Minuit, in 1626, bargained with the Indian owners of Manhattan in the clearing that is now Bowling Green, and bought the island for $24. The scene of this historic transaction lies under the windows of No. 1 Broadway. Pieter Kocks, a soldier in the Dutch garrison at Nieu Amsterdam built a tavern in 1647 facing the Bowling Green, on the corner now covered by No. 1 Broadway.



Ground Floor Plan

In 1664—when the British flag replaced the Dutch on the old fort across the way—a new tavern was erected on the site, by Thomas Broen. Archibald Kennedy, Captain in the Royal Navy, built a spacious mansion on the site of No. 1 Broadway in 1768.

Kennedy's mansion was occupied in 1776 by Gen. Israel Putnam, of the American army. Here

No. 1 Broadway. Washington Building erected 1882. Later known as The Coal Exchange

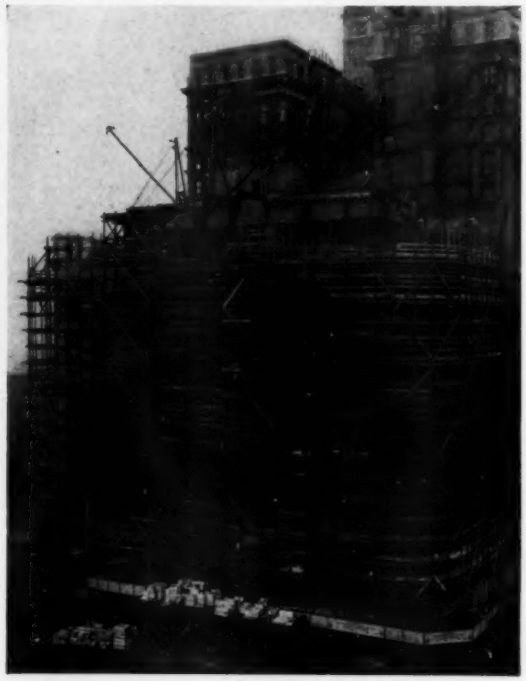
for some weeks Gen. George Washington came frequently from his headquarters at Richmond Hill to confer with his officers. Later the house was occupied in turn by Sir William Howe, and Sir Henry Clinton, successively commanders of the British naval and military forces which occupied the city on the retirement of Gen. Washington's army. It was from this house that Major Andre wrote the letters to Benedict Arnold, which preceded the American officer's betrayal of his trust, and Andre's capture and execution.

The Kennedy mansion was restored in 1783 to its owner, who sold it to Nathaniel Prime, one of New York's leading merchants and financiers, active in the financing of the New York Water Supply Company organized by Aaron Burr (Vice President of the United States 1801-5).

In 1794 the Prime home became a house of public entertainment known as the Washington Hotel. In this hotel Tallyrand, the exiled Minister of Napoleon, made his home for a time. With the passing of the years the hotel became gradually a combined hotel and office building until, in some year not recorded, it was converted into an office building.

Cyrus W. Field, of Atlantic Cable fame, bought No. 1 Broadway in 1882. Here he erected a 12 story office structure, then the tallest in lower New York, known as the Washington Building, and, later as the Coal Exchange.

In 1919 the property was purchased by the International Mercantile Marine Company and Mr. Walter B. Chambers, F. A. I. A. was intrusted as Architect with the alteration of the structure. Mr. Chambers had the triple task of converting a late-Victorian wall bearing office building into a modern fire-resistant structure; designing the fronts on three streets to typify the occupancy, that of a



Remodeling No. 1 Broadway 1919-21. Upper stories torn down. Staging in place for the setting of the new stone facing

ship owning company, whose ships sail the seven seas; and having ever in mind the jealous regard of the public for historic localities. How well the task was performed is left to the judgment of those who study the views here presented.

The old building was first constructed to a height of ten stories, the two upper stories being added several years later. All exterior, and some interior walls were bearing walls having thicknesses proportioned to loads which were apparently figured liberally. The few interior columns were

square, of cast iron and all beams and girders were of wrought iron. The outside walls were faced with red brick and all trim was of brownstone. There was but one stairway and six slow speed elevators in two banks.

The reconstructed building is 12 stories in height, with two mezzanines and two roof pent houses, one of which contains offices. There are two separate main stairways and eight high speed electric elevators, four at the Broadway side, three at the Greenwich side and one private. There are two entrances to offices, one from Broadway and one from Greenwich street. The elevator halls and arcade are connecting, the floors and walls being of marble. The iron grille elevator doors as well as

Tenth floor level ready for new walls. Note bolts set in old walls to serve as ties. Walls above this level are of tile faced with stone

all grille work throughout the building contain nautical and marine suggestions in keeping with the building. The doors opening into the arcade are of bronze,

The new exterior has a granite base up to the first floor level and light buff Indiana limestone above. The panels are of Cipolin marble and the piers in the second story carry Venetian Mosaic shields with the coats of arms of the leading ports of call of the company's ships. These heraldic designs are beautifully worked in colors and indicate with good taste that the building is more than local in character. From the stone carvings around the shields project bronze sockets for flag staffs. The Stars and Stripes float over the main entrance, the house flags of the company's lines occupying minor flanking positions.

Over the arch of the main entrance are carved Neptune, god of the sea and Mercury, god of commerce and trade, with the American eagle

Old brick walls prepared for the stone facing

above. The architectural and decorative mouldings and carvings contain representations of star fish, sea shells and sea plants.

The booking office extends the entire length of the Battery Park front of the building, from Broadway to Greenwich street with a length of

The framing for the new upper floors

100 feet and a breadth of 40 feet. The ceiling height is 25 feet. The floor and counters are of marble and set in the floor at the east and west ends are large ships compasses in vari-colored marbles. The walls are panelled in soft buff Botticino marble with pillars of rich black marble irregularly lined with white. The designs of the

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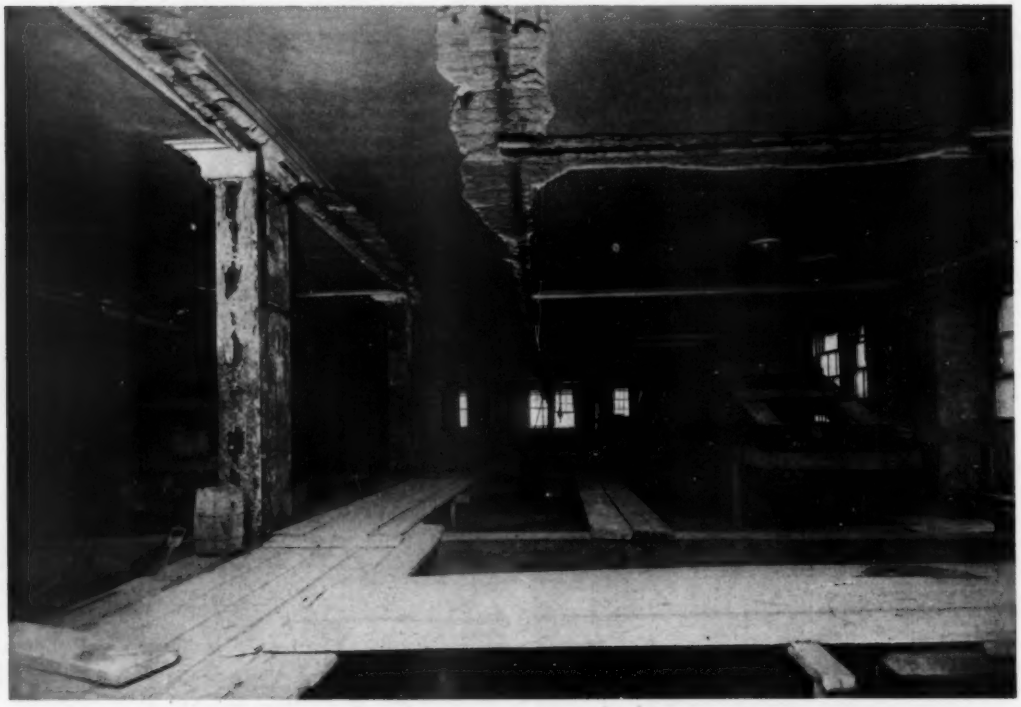

Heavy Trusses used to carry the girders which were hoisted into place by means of chain blocks. The cast iron columns here shown remain in the remodeled structure resting on girders

Braced vertical towers supporting heavy trusses on second floor, the lower chords of which are seen at ceiling level with chain blocks in place. Cast iron columns were removed after girders were placed

lighting fixtures are patterned some after old ships lanterns and some after terrestrial globes. On the main wall are two large frescos, one of the eastern and the other of the western hemisphere. There is a small moving picture hall in which films will be shown portraying life aboard the company's ships.

Needling and supports for walls

The Engineering Features

Loss of income during the period of remodeling of an old building is an item of cost, the amount of which in this instance was kept as low as possible. All preparatory work in the basement was well under way before tenants on the first and second floors vacated their offices. The tenants on the third to the ninth floors inclusive were not disturbed. All tenants above the ninth floor were obliged to move. The presence of tenants on seven floors and the necessity for insuring to them uninterrupted service and convenience with absolute safety, required careful planning and an absolute adherence to predetermined methods and schedules.

Shoring supporting old pier cut out to receive new work

The old building was completely dismantled down to the tenth floor, temporary roofing was erected and new steel framing placed for the new upper floors and roof. The walls were built of tile and the stone facing placed independently of the work below. In fact the work proceeded as though an independent building was erected above the ceiling of the ninth floor. The original red brick and brown stone walls were cut back to receive the new stone facing, starting at the bottom,

Steel plate bases bolted to cast iron columns to carry loads to plate girders on floor below. Girders are in pairs passing the columns below which were later removed

the new work following immediately. The old walls being self-sustaining bearing walls the work called for the exercise of great care and judgment. Fortunately they were very thick and of excellent construction. Nevertheless shoring and needling were used freely and more than ordinary care was exercised at all times.

The column and girder installation included the taking out of ten old cast iron columns from the foundation up to the second floor and the removal of one of the cross-bearing walls. Concrete piers against the exterior and court foundation walls were installed and connected across the building, underneath the basement floor, by reinforced concrete girders, designed to pass on each side of, and leave undisturbed, the interior column foundations, for which purpose two sides of the heavy granite base blocks of these latter were partly cut out.

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Girders in place under second floor. The ends are supported on steel columns encased in brick piers. The cast-iron column at mid-span was removed after girders were seated and bases were bolted to columns in second story.

On these piers and girders steel columns were erected against the exterior and court walls, extending up to the ceiling of the new booking office, with steel bolsters at top for support of large plate girders to carry the centre line of the old cast iron columns from the second floor up. The columns were solidly encased in the new brick lining of the exterior and court walls.

At each end of the building under the second, former third, floor, is a plate girder 56-in. deep with 38 in. flanges, the weight of each girder being 32 tons. Six pairs of intermediate girders 56-in. deep with 21-in. flanges, each single girder weighing 17 tons, carry the interior columns from the second floor to the roof. Several smaller cross girders were also installed each one weighing about 12 tons. The intermediate girders in pairs were installed on each side of the old cast iron columns, against which were bolted at the second floor, large steel flange bases for the purpose of transmitting the column load, to the plate girders.

Steel wedges placed between the bases and top of the plate girders were carefully driven to gradually take up the load. When the entire load of the line of old columns had been transmitted to the girders, and these had assumed their permanent deflection, the old columns below the second floor were removed. Then, as an auxiliary, and as an additional safety precaution, a steel shoe or blocking was installed and wedged up between the pair of girders, below the cast iron column, giving a direct vertical support.

The hoisting of the plate girders, which was done by means of two 20 ton chain blocks hung on heavy timber movable trusses, resting on the old second story floor construction, was preceded by the construction of an elaborate system of vertical and horizontal shores, braces and tie

rods to support the chain block trusses and old floor construction, and prevent lateral movement of walls, piers and old columns. At no time during the entire operation was a line of old columns left unbraced in any direction.

As each girder was hoisted it was followed by a heavy timber cribbing built up at each end in such a way that an unexpected drop of the girder would not have been greater than a few inches. This timbering is shown in the figure below.

Placing the heavy girders and following with cribbing to minimize damage in case of accidental drop

MAJORITY OF CITIES HAVE NO BUILDING CODE

By Richard G. Kimbell*

THE utter lack of ordinances regulating construction in the majority of the cities of this country is astonishing. Most communities, I suppose, have the feeling that it is folly to undertake work of this or any other kind without first knowing that they will be able to finish it—as half finished work generally proves to be labor lost. There cannot justly be any objection to having up-to-date, workable building codes any more than to other good things, provided they cost nothing. The principal objection apparently is their expense, and the objection to paying arises largely from the want of ability to pay.

A real or imagined lack of ability to pay for a code and the subsequent expense of its enforcement accounts chiefly for the situation disclosed by an investigation of conditions recently conducted by the National Lumber Manufacturers' Association.

This Association made a canvass both by letter and personal representation of all of the cities containing more than 5,000 population in the United States. According to the 1920 census there are 1478 such cities.

*Architectural & Building Code Bureau.
National Lumber Manufacturers' Association.

The results of the information secured by this canvass are set forth in tabular form as follows:

	Pop. over 25,000	Pop. 10 to 25,000	Pop. 5 to 10,000	Total
Number of Cities in U. S.	279	460	739	1478
Cities with Code & Inspector	210	90	46	346
Code but No Inspector	13	26	25	64
Total Number with Codes	223	116	71	410
% of No. of Cities with Codes	79.9	25.2	9.6	27.0
Number with Inspector & no code	22	73	31	126
No Code & No Inspector	20	136	172	328
No Information Secured	14	135	465	614
Drafting or Revising Code	89	33	8	130
% of Cities with Code Activity	31.5	7.0	1.0	8.7

As far as information was obtained, only 410 cities (27 per cent. of the entire number of cities) have a building law, and in all probability twenty or more of these are included as a part of the original city charter. Other cities claiming codes had what were merely a set of restrictions specifying the area known as the "Fire Limits." In the majority of cases where the restrictions as to fire limits only prevail, the ordinance merely specifies the area included within such limits and requires that the buildings erected therein shall have incombustible walls and roofs, without any restrictions as to the allowable height of buildings, the maximum area between fire walls, or the character of the interior construction. As long as the exterior walls are of masonry and the roof supposedly incombustible, any kind and variety of fire trap and hazard may be constructed within the building and cover any area. In all probability, those laws are the only ones in effect as relating to buildings in 65 per cent. of the cities of over 5,000 population in this country where the construction industry is one of the mainstays of our national welfare and progress.

There are 259 cities with a population of over 25,000 and only 223, or 80 per cent. of these gave evidence of having a building code. Thirteen of those cities having codes have no enforcing officer. Twenty-three cities having no code gave information to the effect that they do have a building inspector. His duties seem to be indefinite.

Of the 460 cities with a population of from 10,000 to 25,000 only 116, or 25 per cent. have a building law and 26 of these have no officer to enforce it. Seventy-three apparently had a building inspector but he is, presumably, the Fire Chief who acts in enforcing some of the fire prevention requirements.

Out of the total of 739 cities of from 5,000 to 10,000 population, the small number of 81, or 9 per cent. have building laws and 25 of these have no means of enforcement.

The table shows quite a large number of cities from which no information was forthcoming. The majority of them are from 5,000 to 10,000 population and it is safe to assume, by considering the situation in the balance of the cities of that population, that they have neither a building code nor an inspector. It was definitely determined that 42 of the cities of over 25,000 population have no building code whatever.

A number of cities which have such laws have no copies available for the use of the public, the builders and architects. Some of them are hidden away in the minutes of the council meetings. The man who erects a building or has the supervision of the construction of a building must, necessarily, delve through musty records to determine what regulations he must comply with when building.

One large city of over 135,000 population has gone so long without any constructive revision to its building code that a reprint has not been made since 1912 and the building department of that city has in its possession only one printed copy of the code. Another city has its building code included as a part of its general ordinances and a charge of five dollars per copy is made when those who wish to build desire to have the necessary information available in their offices.

The facts presented here warrant thought by our engineering, architectural and civic bodies and by all others who are in any way interested in the welfare, growth and development of our cities.

Improvement in Gypsum Plaster.

MANUFACTURERS of gypsum wall plaster announce that a new manufacturing process has been adopted. The statement is made that this is the first radical change in 4,000 years. The new product is known as syanized plaster. The process seals each minute particle of gypsum against atmosphere moisture. The plaster loses none of its sand-carrying capacity, even when stored for many months. It does not go "dead" while in storage, and, being always "fresh," assures full coverage. Other economies of this plaster are the rapidity with which it takes the water in mixing, and its unusual plasticity under the trowel.

THE best available data on the strength and related properties of metals and alloys have been collected and published by the U. S. Bureau of Standards in *Circular No.* 101. It includes the tensile strength, proportional limit, percentage of elongation in 2 in., percentage of reduction of area, Brinell and scleroscope hardness of such materials as iron, carbon steel, alloy steels, wire and wire rope, semi-steel, aluminum, copper, etc. In addition figures are given in some cases for the compressive and shearing strengths and moduli of rupture.

THE AMERICAN SPECIFICATION INSTITUTE

127 North Dearborn Street, Chicago.

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THE American Specification Institute has been organized to improve all conditions surrounding the writing of specifications, to foster intelligence and accuracy in their preparation and to bring to its members the benefits that are to be obtained from the organized efforts of men who are accustomed to study and write these most essential documents.

The kinds of specifications that are to be studied are those written by the architect or engineer in the ordinary course of his professional practice, including all classes of buildings and engineering structures, their equipment and interior decoration and finish to make them ready for occupancy and efficient use and for the embellishment of grounds, estates and waterways.

The American Specification Institute does not feel it necessary to include within its province of detailed study and analysis, the preparation of specifications that are to guide manufacturers producing valves for high pressure steam lines, cement, electric switches or any of the countless manufactured articles that are used in building and engineering construction of all kinds. There are in operation at the present time thoroughly efficient research organizations who are making studies of such problems and the reports of their deliberations are accepted by all technical professions as authoritative.

However, in the use of cement for instance, the interest of the architect or engineer is very keen in the study of its practicable use. In the case of this product The American Society for Testing Materials has a standard specification governing its actions under tests and any cement that passes the tests of this Society is acceptable to the well-informed user, and any cement which fails to pass these tests is condemned. The interest of the architect or engineer, then, begins where the interest of The American Society for Testing Materials ends. At this point, also, the American Concrete Institute begins to exercise its interest in the use of the material. Therefore The American Specification Institute will see that all of its members have at hand a copy of the current standard specifications of The American Society for Testing Materials that have to do with the testing of cement or any of the other building materials. For the same reason the membership will be kept informed of the activities of the American Concrete Institute, The United States Bureau of Standards and all other research organizations that are studying the most efficient methods for the utilization of cement and its behavior under the various conditions to which it is subjected.

Many of the valuable reports respecting investigations that have been conducted by authoritative organizations and which are of the greatest interest to specification writers have not, in the past, been brought to their attention. There are many reasons for this seeming secretiveness, the most prominent one being the fact that there has been no organization whose duty it has been to bring to the attention of specification writers all these matters. They have been left to their own devices in most instances and although a few men have been willing to devote hours of research for information on some particular point, such painstaking efforts have not been universal. The American Specification Institute through its various activities in behalf of its members, will save countless hours of duplicate study and will, consequently, be of constant and ever-present assistance in the correct analysis and writing of specifications.

The American Specification Institute has divided its activities into two general classes, that is (a) study of materials used in building and engineering construction and equipment, embracing the production and physical properties of raw materials, methods of manufacturing, fabrication and finishing in order that the specification writer will be more familiar with his work and a study of relative values of materials as based on appearance, initial cost and maintenance, effect of combination with other materials and proper materials for various types of buildings of varying grades and (b) a study of the method of writing specifications. In this latter class there will be studied the means of accomplishing complete co-operation between the drawings and specifications and to determine what methods of construction and installation should be used under given average circumstances, what the drawings should show or indicate and what should not be shown or indicated on the drawings for inclusion in the specifications.

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THE development of an outline or checking list will be given attention. This subject already has been made the subject of several bulletins and has proved to be of very great interest to the members. The arrangement of specifications so as to conform to the sequence of construction and installation work, the writing and composition of specifications that are clear, concise, coherent and that can be understood by law courts and the principles of contract law as it affects the writing of specifications, all will be subjects of bulletins.

All bulletins will be issued in loose-leaf form to be placed in the cover which is furnished by the Institute. This will permit the revision of obsolete bulletins and the insertion, in orderly sequence, of all subsequent sheets. These bulletins will be made in the standard letter size sheet as has been recommended by The American Institute of Architects and it is expected that eventually there will be available to members a most valuable and highly useful text book of data respecting the preparation of specifications.

New Members

The following men have been elected to membership, Active grade:

F. P. Platt & Bro. Architects, New York City.
Herman J. Bargehr, Architect, Lyons, Iowa.
Elwyn E. Seelye, Engineer, New York City.
James M. Macqueen, Architect, Sewickley, Pa.
Norton Kirkpatrick, Architect, Niagara Falls, N. Y.
John W. Vickery, Architect, Rochester, N. Y.
Norman Reid Lightbody, Architect, Christchurch, New Zealand.
Richard C. Worden, Engineer, Bakersfield, Calif.
Chester Eugene Dean, Architect, Kansas City, Mo.
Joseph Hudnut, Architect, New York City.

Bulletin No. 1.

A revision of Bulletin No. 1, in accordance with suggestions that have been made by many of the members, is now being prepared and will be issued shortly. This bulletin is as follows:

Building Construction and Equipment
General Specification Outline

1—Matters Preliminary to Contract
2—Agreement and Schedule of Conditions of Contract
3—Work Preliminary to Construction
4—Inspection of Materials
5—Wrecking and Clearing Site
6—Surveying and Grades
7—Excavations
8—Foundations
9—Waterproofing
10—Structural Steel
11—Concrete Masonry
12—Reinforcing Steel
13—Fireproofing (Terra Cotta)
14—Stone Masonry
15—Artificial Stone Masonry
16—Brick Masonry
17—Cohesive Tile Work
18—Architectural Terra Cotta
19—Rough Carpentry Work
20—Ornamental Bronze & Iron Work
21—Miscellaneous Steel & Iron Work
22—Solid Steel Windows
23—Fireproof Hollow Metal Windows
24—Sheet Metal
25—Slate Roofing
26—Tile Roofing
27—Composition Roofing
28—Furring and Lathing
29—Plain and Ornamental Plastering
30—Models for all Work
31—Hollow Metal Trim
32—Kalamein Trim
33—Wood Cabinet Work
34—Interior Structural Slate Work
35—Interior Marble Work
36—Scagliola
37—Mosaic and Faience Tile Work
38—Terrazzo Work
39—Cork Tile Floors
40—Composition Floors
41—Rubber Tile Floors
42—Glass and Glazing
43—Structural Glass
44—Painting
45—Decoration
46—Draperies
47—Acoustical Correction
48—Hardware
49—Weather Stripping
50—Window Screens
51—Window Shades
52—Elevators
53—Elevator Signals
54—Dumbwaiters
55—Escalators
56—Pneumatic Tubes
57—Conveyors
58—Mail Chute
59—Master and Secondary Clocks
60—Express Call System
61—Telegraph Call System
62—Electric Recording Systems
63—Inter-communicating Telephone Systems
64—Electric Call Systems
65—Electric Signal Systems
66—Electric Wiring
67—Electrical Machinery and Equipment
68—Lighting Fixtures
69—Sewerage and Drainage
70—Plumbing
71—Pumps and Ejectors
72—Gas Fitting
73—Water Purification
74—Water Softening
75—Drinking Water Systems

76—Fire Protection Equipment
77—Automatic Sprinkler Systems
78—Refrigeration Machinery and Piping
79—Cold Storage Insulation
80—Heating
81—Ventilation, Mechanical
82—Power Plant Work and Equipment
83—Smoke Stacks
84—Heat Insulation
85—Permanent Building Equipment
86—Furniture and Fixtures
87—Landscape Architecture
88—Garden Furniture
89—Sculpture
90—Walks
91—Roads and Streets
92—Bridges

Members are requested to give Bulletin No. 1 their careful study and to suggest whatever changes or corrections they believe would improve or add to the general utility of the outline, notifying the Executive Secretary's office of their suggestions. When a majority of the members have made their response, a revised bulletin will be distributed for further criticism or for general acceptance as a tentative standard document.

Subsequent bulletins will carry detailed outlines of the items in the General Outline. These bulletins will be issued on the first and fifteenth of each month.

The earnest co-operation of all members is requested by the Board of Governors.

House of Clarence F. Jameson, Lafayette, Ind.
Charles W. Nicol, Architect

XUM

PERSONALS

SOCIETY OF BEAUX-ARTS ARCHITECTS

In the report and illustrations of the Final Competition for the 14th Paris Prize of the Society of Beaux-Arts Architects, published in our issue of September 14, the author of the design placed third was given as E. E. Weston, Jr., whereas the name of the author is A. E. Westover, Jr.

William Schultz has moved his architectural office from 2009 West North Avenue, Chicago, Ill., to 4945 Milwaukee Avenue, that city.

Robert Leal Hyett, architect and designer, has just opened an office at 511 Maple Avenue, Wilmette, Ill.

F. Rosenheim, architect, announces the removal of his office to Suite 402 Pacific Mutual Building, Los Angeles, Cal.

J. H. Johnson, architect, has removed his architectural offices from Sumter, S. C., to Bradentown, Fla.

Manley Clark Marcellus has opened an office for the practice of architecture at 105 Torrey Building, Duluth, Minn.

Announcement is made that Fabian & Donovan, architects, are now located at 147 Bradley Street, New Haven, Conn.

Harry Price, architect, has moved his offices from 709 Mercantile Library Building, Cincinnati, Ohio, to 602 that building.

Clifton C. West, formerly of the firm of Beckenstin & West, is now practicing architecture at 54 Church Street, Hartford, Conn.

Della Penna & Erickson, architects, located at 289 East 149th Street, New York City, are desirous of receiving manufacturers' samples and catalogs.

W. Sanford Full has recently opened a studio for the practice of architecture at 376 Central Street, Saugus, Mass., and desires manufacturers' catalogs and samples for his files.

Moritz Sax, architect, has moved from 1011 Fourth National Bank Building, Cincinnati, Ohio, to larger offices at 611 Johnston Building, that city.

Davis & Wilson, architects, have succeeded Ellery Davis at Lincoln, Nebr. The offices will remain in the Security Mutual Life Building, that city.

Clyde W. Smith, architect, who was formerly practicing his profession in the Andrus Building, has moved his offices to 700 Oneida Building, Minneapolis, Minn.

Ralph T. Abell, recently in government employ in the South, has resumed his architectural practice, with offices in the Spurling Building, Elgin, Ill.

H. H. Beckenstin, architect, is now practicing his profession at 54 Church Street, Hartford, Conn. This firm was formerly known as Beckenstin & West.

Howard McClovey, architect, formerly of 506 Fourth National Bank Building, Cincinnati, Ohio, is now practicing in offices on the eighth floor of that building.

Arthur Foster, architect, announces that he is now practicing his profession at 56 East Randolph Street, Chicago, Ill. He was formerly located at 155 North Clark Street, that city.

It is announced that T. M. Campbell, architect, is now practicing at 426 Atlantic Trust Company Building, Atlanta, Ga. His offices were formerly in the Johnson Building, Augusta, Ga.

Crowe and Schulte, architects, wish to announce that they have moved their architectural office from 1105 Second National Bank Building, Cincinnati, Ohio, to the Title Guaranty Building, that city.

Bart Tourison and Benjamin F. Betts, both graduates of Cornell University, wish to announce that they have opened an office for the practice of architecture at 1212 Land Title Building, Philadelphia, Pa.

H. Rafael Lake, architect, announces the opening of an office for the practice of architecture in the Balboa Building, San Francisco, Cal. Manufacturers' catalogs and samples are requested.

Henry John Burden and G. Roper Gouinlock announce the formation of a partnership for the practice of architecture under the firm name of Burden & Gouinlock, with offices at 101 King Street West, Toronto.

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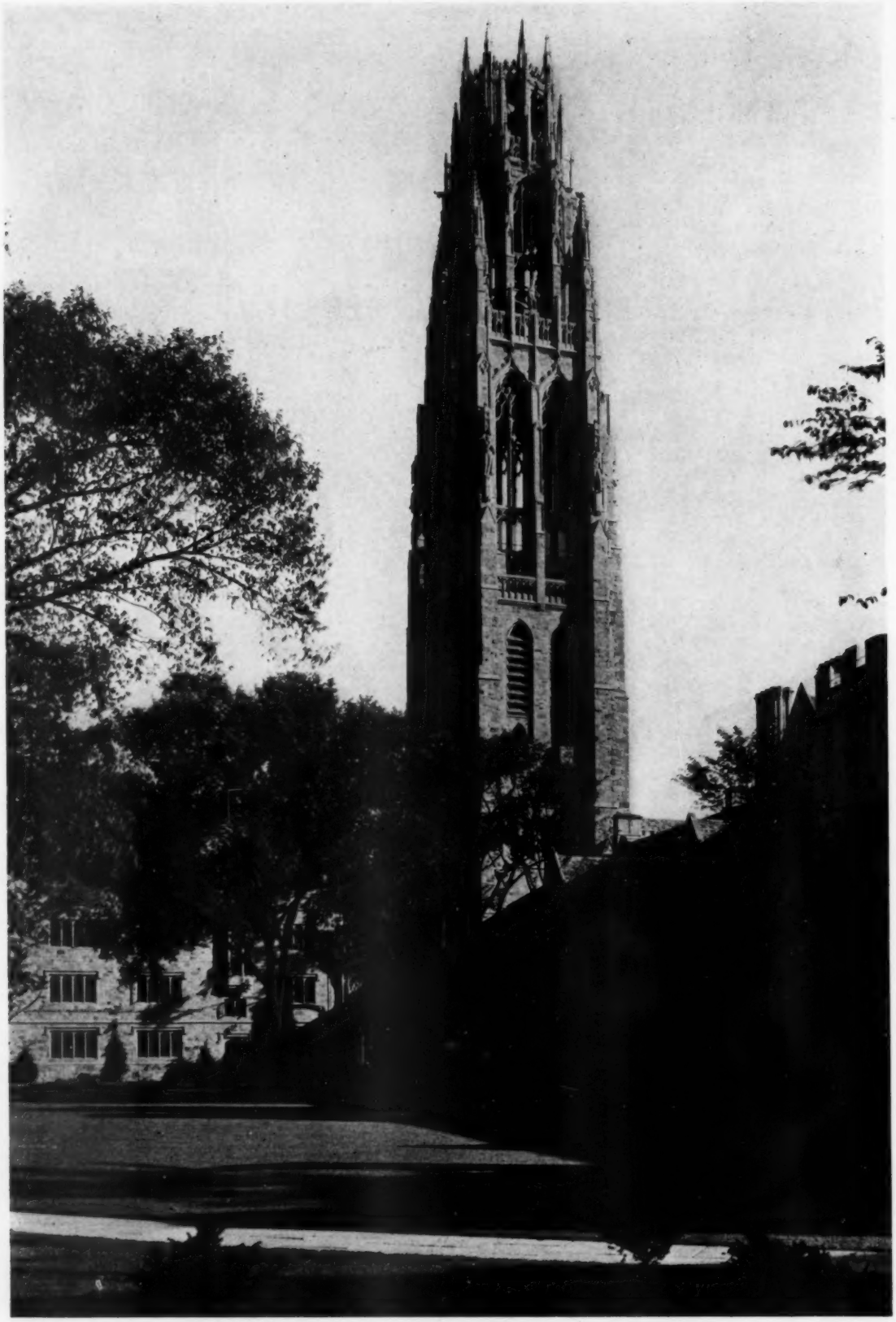

VIEW LOOKING ACROSS BRANFORD COURT

THE HARKNESS MEMORIAL TOWER, YALE UNIVERSITY, NEW HAVEN, CONN.

JAMES GAMBLE ROGERS, ARCHITECT